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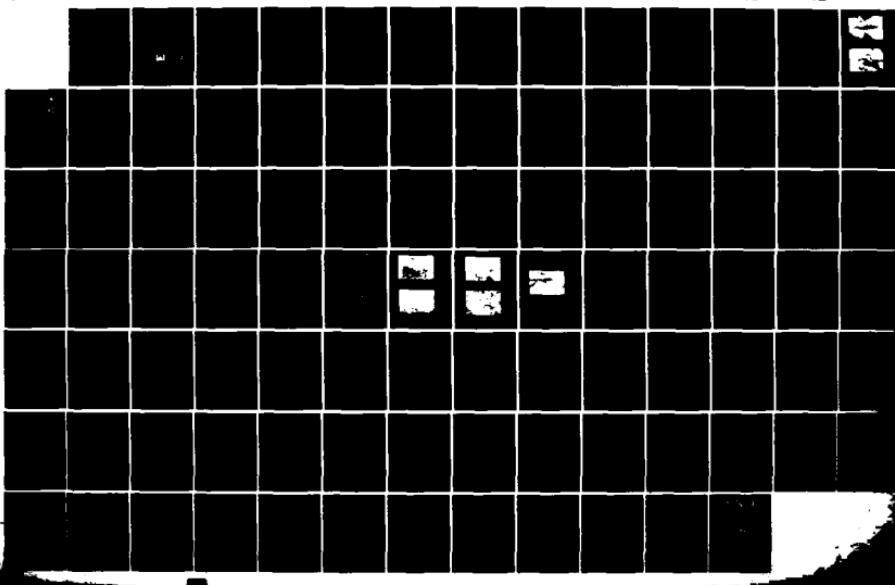
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
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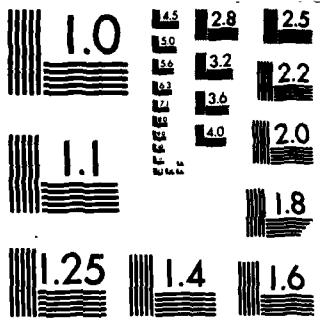
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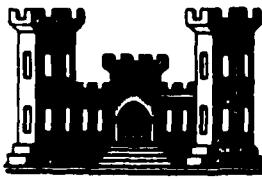
MERRIMACK RIVER BASIN
WILTON, NEW HAMPSHIRE

STOCKWELL BROOK DAM

N H 00261

NHWRB 254.09

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

APRIL 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is an earth embankment with a concrete cut off wall. The dam is about 139 ft. long and 24 ft. high. The dam is small in size with a significant hazard potential. This type of spillway is very susceptible to obstruction by ice or other debris. The dam is in fair condition at the present time. Improved maintenance is required at the dam.			

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 03 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Stockwell Brook Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, Wilton Water Works, Wilton, New Hampshire 03086.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,

Max B. Scheider
MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

STOCKWELL BROOK DAM
NH 00261

Accession For	
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WILTON, NEW HAMPSHIRE
MERRIMACK RIVER BASIN



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I REPORT

Identification No.: NH 00261
NHW RB No.: 254.09
Name of Dam: STOCKWELL BROOK DAM
Town: Wilton
County and State: Hillsborough County, New Hampshire
Stream: Stockwell Brook
Date of Inspection: November 8, 1978

BRIEF ASSESSMENT

Stockwell Brook Dam is an earth dam with a concrete cut-off wall. The dam is approximately 139 feet long and 24 feet high. The spillway is a drop chamber structure with two waste pipes draining the chamber. The weir length at the top of the spillway is 8 feet, and the crest level can be adjusted through the use of stop logs. There are 2 intake structures which have pipes connecting to a 12-inch line which supplies water to the town of Wilton. The impoundment reservoir is known as the New Wilton Reservoir.

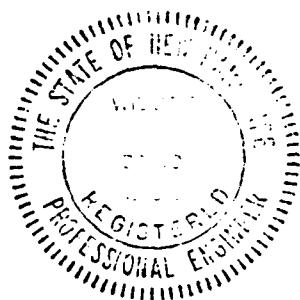
The dam is a water supply structure for the town of Wilton and is owned by the Wilton Water Works. The drainage area is 0.4 square miles of primarily forested terrain. The dam's maximum impoundment of 335 acre-feet and height of 24 feet place the dam in the SMALL size category. In the event of a dam failure, the possibility of property damage but small chance of loss of life dictates that a SIGNIFICANT hazard potential classification be assigned for the dam.

Based on the size and hazard classifications, and in accordance with the Corps' of Engineers guidelines, the Test Flood (TF) would be between the 100-year flood and one-half the Probable Maximum Flood (PMF). Since the hazard potential is on the low side of the SIGNIFICANT category, the TF at Stockwell Brook Dam is taken as the 100-year flood.

The selected TF inflow is 250 cfs but because of the surcharge storage in the reservoir the flow at the dam is 143 cfs. The peak discharge of 143 cfs would result in a stage at the dam of 1.9 feet above the present spillway crest with stop logs to elevation 608.0 or 0.4 feet above the crest of the dam. Under these conditions the discharge through the spillway and waste pipes would be 33 cfs. If the stop logs were removed to elevation 606.0 the maximum stage at the dam would be 0.9 feet below the crest of the dam with a peak discharge of 100 cfs through the spillway and waste pipes. With the stop logs removed the spillway can pass the peak TF flow without overtopping provided there is no blockage of the spillway. However, this type of spillway is very susceptible to obstruction by ice, logs or other debris.

Stockwell Brook Dam is in FAIR condition at the present time. Improved maintenance is required at the dam. It is recommended that a registered professional engineer be retained to investigate the seepage at the downstream toe, to perform further hydrologic and hydraulic analyses to determine what measures are necessary to increase the discharge capacity at the dam, and to observe the condition of the lower intake structure when the water level has been lowered. The results and recommendations of these additional studies should be implemented. The stoplogs should be removed immediately to elevation 606.0 or lower and should not be replaced above this level until all of the findings and remedial measures have been implemented. Recommended remedial measures include removing the pine tree (and its roots) near the headwall, installing a log boom, repairing the spalled concrete on the gate chamber and headwall, servicing the 4 gate valves, removing all brush and trees (and their roots) from the embankment, preparing a written warning procedure to alert downstream people in the event of an emergency, and instituting a program of annual technical inspections.

The recommendations and improvements outlined above should be implemented within one year of receipt of this report by the owner.



William S. Zoino

William S. Zoino
N.H. Registration 3226

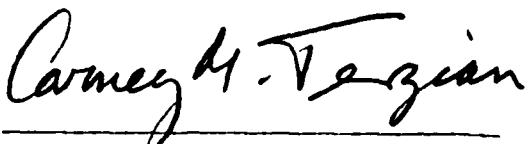
Nicholas A. Campagna, Jr.

Nicholas A. Campagna, Jr.
California Registration 21006

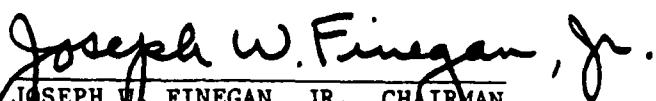
This Phase I Inspection Report on Stockwell Brook Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

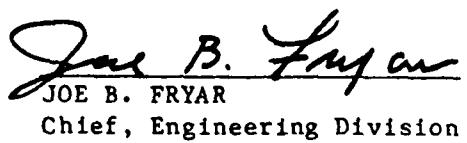


CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division



JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the Test Flood should not be interpreted as necessarily posing a highly inadequate condition. The Test Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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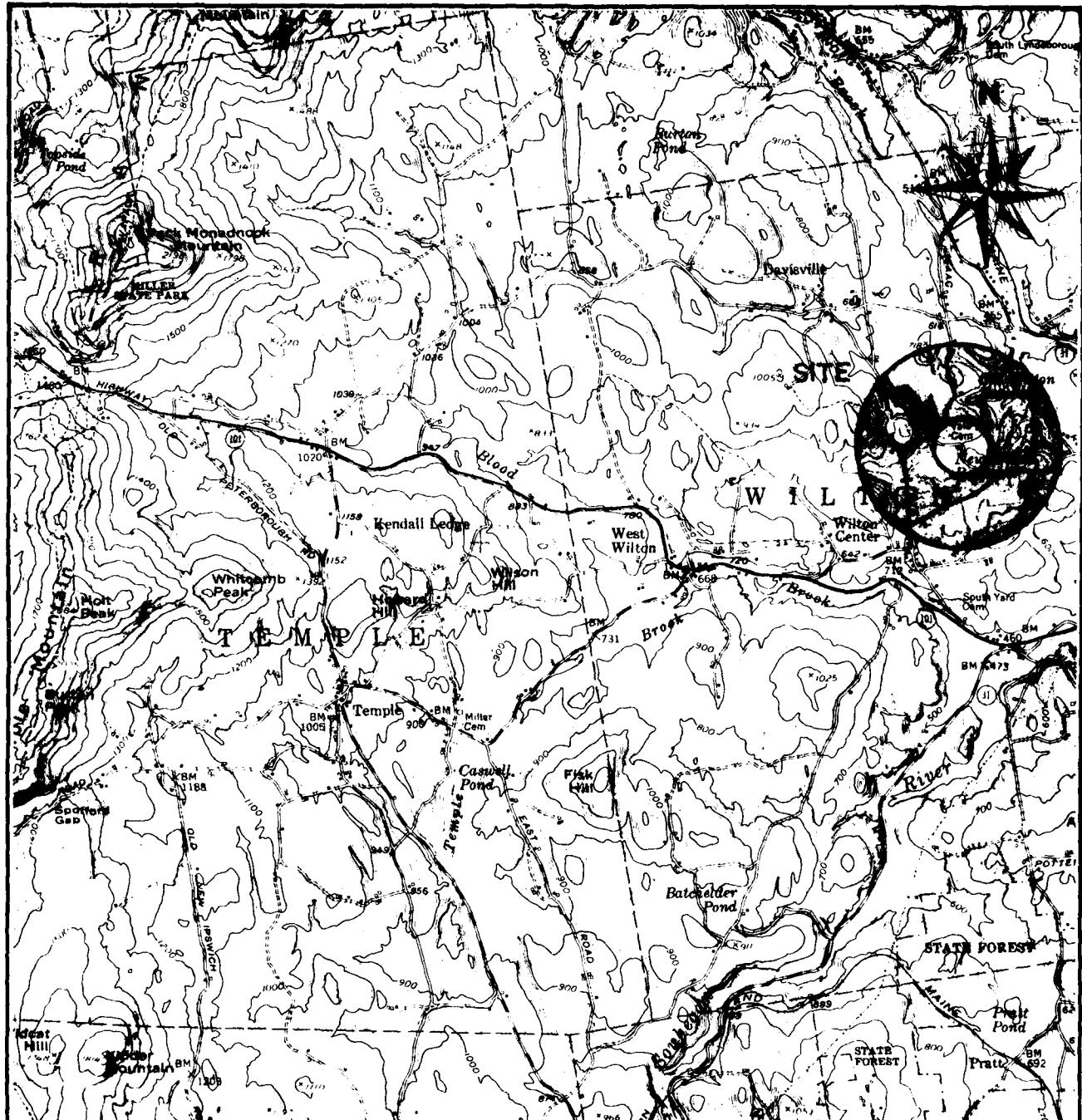
APPENDIX E - INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS E-1



Overview of dam from upstream left side



Overview of dam from left abutment



- SCALE -

FROM: USGS PETERBOROUGH, N.H.
QUADRANGLE MAP

**GOLDBERS, ZOINO, DUNNCLIFF & ASSOC., INC.
GEOTECHNICAL CONSULTANTS
NEWTON UPPER FALLS, MASS.**

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCUS PLAN

FILE No. 2201

STOCKWELL BROOK DAM

NEW HAMPSHIRE

SCALE	AS NOTED
DATE	NOVEMBER 1978

PHASE I INSPECTION REPORT

STOCKWELL BROOK DAM

SECTION 1

PROJECT INFORMATION

1.1 General

(a) Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Goldberg, Zoino, Dunncliff & Associates, Inc. (GZD) has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed was issued to GZD under a letter of November 28, 1978 from Colonel Max B. Scheider, Corps of Engineers. Contract No. DACW 33-79-C-0013 has been assigned by the Corps of Engineers for this work.

(b) Purpose

- (1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.
- (2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.
- (3) Update, verify, and complete the National Inventory of Dams.

(c) Scope

The program provides for the inspection of non-federal dams in the high hazard potential category based upon location of the dams and those dams in the significant hazard potential category believed to represent an immediate danger based on condition of the dam.

1.2 Description of Project

(a) Location

Stockwell Brook Dam lies on Stockwell Brook in the town of Wilton, N.H. The dam is located approximately 2 miles southwest of the center of Wilton and can be reached via an access road which connects Route 101 and Frye Street. The access road is located north of the intersection of Frye Street and Route 101. The portion of USGS Peterborough, N.H. quadrangle presented previously shows this locus. Figure 1 of Appendix B presents a detail of the site developed from the inspection visit and the quadrangle map.

(b) Description of Dam and Appurtenances

Stockwell Brook Dam is an earth embankment dam with a concrete core and cut-off wall. The dam is 139 feet long with a top width of 22 feet and a hydraulic height of 24 feet. The upstream slope of the dam is 2.5 horizontal to 1 vertical while the downstream slope is 2 horizontal to 1 vertical. The core and cut-off wall including the gate house foundation is approximately 139 feet long. The top width at elevation 608.5 is one foot and has a back batter of 1/2 inch in one foot. Available plans (Fig. B-3) indicate the wall is founded partly on bedrock and partly on natural soil.

The appurtenant structures include a combined spillway and gate chamber, upper and lower water intake chambers, a headwall at the downstream toe of the dam, a supply intake, and a waste water piping system.

The combined gate and spillway chamber (Figure B-4) is 10 feet by 14.8 feet in plan and is monolithically cast with the reinforced concrete cut-off wall (Figure B-3). A brick gate house is 8 feet by 8 feet in plan and contains 4 gate valves. The chamber is 24.5 feet deep. The downstream wall, which is part of the core and cut-off wall is 24 inches wide at the base and 12 inches at the top. The other walls are 12 inches thick over their entire length. Four gate valves (Figures B-4 and B-5) regulate the flow from the two intake lines into the chamber from the water supply reservoir. Regulation is into either the domestic water supply system or is wasted through the spillway chamber. The intakes consist of a 12 inch cast iron pipe upper inlet and a 16 inch cast iron pipe lower inlet. Both intake lines are connected to "Tee" fittings within the chamber with gate valves on either side of the Tees. Gate valves, 16 inch and

12 inch are located on the upstream end of the Tees for wasting water into the spillway chamber. Two 12 inch gates, which are interconnected with a piping system, are located downstream of the Tees for controlling flow into the 12 inch domestic water supply system. Where water is wasted, the two 12 inch gates are closed and the 16 inch and 12 inch waste gates are open for discharge into the spillway chamber. Under normal operating conditions the 16 inch and 12 inch waste gates are closed and the two 12 inch water supply gates are open. Any discharge which flows into the spillway chamber outlets via 24 inch and 16 inch cast iron, uncontrolled conduits which penetrate through the embankment and terminate at the downstream headwall. All four gates are manually operated from within the gate house constructed over the outlet chamber. The downstream headwall is approximately 6 feet long and 12 inches wide.

The 4 ft. by 8 ft. spillway chamber (Fig. B-4), which is cast with the gate chamber, has reinforced concrete walls. The roof of the chamber is a 5 inch thick reinforced concrete slab with a 24 inch manhole opening. There is a spillway opening 3 feet high and 8 ft. wide. There are provisions for stop logs, and four stop logs with a total with a total height of 2.5 feet were in place to elevation 608.0.

The reservoir intake structures are identical "U" shaped reinforced concrete structures 4 feet wide and 7.5 feet long. Both structures have provisions for removable screens.

(c) Size Classification

The dam's maximum impoundment of 335 acre-feet and height of 24 feet place the dam in the SMALL size category as defined in the "Recommended Guidelines."

(d) Hazard Potential Classification

The hazard potential for the Stockwell Brook Dam is considered to fall within the SIGNIFICANT category. This is based mainly on the possibility of some damaging flooding at the houses 2 miles downstream along Stony Brook just outside Wilton, N.H. (See Section 5)

(e) Ownership

The dam is owned by the town of Wilton and is operated through the Wilton Water Works. The water works is controlled by 3 part-time commissioners. Mr. Charles McGettigan is one of the commissioners. The telephone number for the Wilton Town Hall is 603-654-9451.

(f) Operator

No operation of the dam is performed. There is no operator for the dam.

(g) Purpose of Dam

The dam is used to provide water for the town of Wilton. The reservoir supplements the Old Wilton Reservoir located to the north of the New Wilton Reservoir.

(h) Design and Construction History

The dam was designed by Weston and Sampson, Consulting Engineers in Boston, MA in 1931. Construction of the dam was started in 1931, and according to the files of the New Hampshire Water Resources Board, the dam was completed in 1933.

(i) Normal Operating Procedure

No operation of the dam is performed. Although there are several ways in which to operate the dam and control flows, the level of the reservoir is allowed to go up and down without adjustment of the gates. The gates leading to the water supply are presently open.

1.3 Pertinent Data

(a) Drainage Area

Stockwell Brook Dam receives runoff from 0.4 square miles of hilly and mostly forested terrain.

(b) Discharge at Damsite

(1) The outlet works consist of an eight foot wide stop log spillway which drops into a chamber drained by 2 waste pipes. The waste pipes have diameters of 16 inches and 24 inches and terminate in the downstream channel at the headwall structure. The invert elevations are 585.0 for both the 16 inch pipe and the 24 inch pipe.

In addition to the waste pipes there are two intake pipes which connect to a 12 inch pipe leading to the town's distribution system. There are two valves for each line which can divert water into the town supply line or into the spillway chamber to be wasted. The intake pipes have diameters of 16 and 12 inches with invert elevations at the gate chamber of 587.3 and 597.0 respectively.

(2) Maximum Flood at Damsite - Unknown

(3) The ungated spillway capacity with the water level at the top of the dam elevation 609.5 is 119 cfs.

(4) The ungated spillway capacity (no stoplogs) with water level at Test Flood elevation 609.1 is 118 cfs.

(5) The spillway capacity with stoplogs at normal pool elevation - NA

(6) The spillway capacity with stoplogs to elevation 608.0 and Test Flood water elevation 609.9 is 33 cfs.

(7) The total spillway capacity (no stoplogs) at Test Flood elevation 609.1 is 118 cfs.

(8) The total discharge (no stoplogs in place) at Test Flood elevation 609.1 is 118 cfs.

(c) Elevation (ft. above MSL)

(1) Streambed at centerline of dam: 586 ±

(2) Maximum tailwater: Unknown

(3) Upstream portal invert diversion tunnel: NA

(4) Recreation pool: NA

(5) Full flood control pond: NA

(6) Spillway crest (with stoplogs): 608.0

(7) Design surcharge (original design): Unknown

(8) Top dam: 609.5

(9) Test flood design surcharge: 609.1 (no stoplogs)
609.9 (with stoplogs
in place at
elev. 608.0)

(d) Reservoir

- (1) Length of maximum pool: 1500 ±
- (2) Length of recreation pool: NA
- (3) Length of flood control pool: NA

(e) Storage (acre-feet)

- (1) Recreation pool: NA
- (2) Flood control pool: NA
- (3) Spillway crest pool: 240 ±
- (4) Top of dam: 335 ±
- (5) Test flood pool: 315 ± (no stoplogs)

(f) Reservoir Surface (acres)

- (1) Recreation pool: NA
- (2) Flood-control pool: NA
- (3) Spillway crest: 23 ±
- (4) Test flood pool: 24 ±
- (5) Top dam: 24 ±

(g) Dam

- (1) Type: Earthfill with concrete core wall
- (2) Length: 123 ft.
- (3) Height: 24 ft.
- (4) Top width: 22 ft.
- (5) Side slopes: U/S 1.5 horizontal to 1 vertical
D/S 2 horizontal to 1 vertical
- (6) Zoning: Homogeneous
- (7) Impervious core: Concrete core wall

(8) Cutoff: Concrete core wall to rock or natural soils

(9) Grout curtain: Correspondence indicates some grouting

(10) Other:

(h) Diversion and Regulating Tunnel - NA

(i) Spillway

(1) Type: Stoplog weir

(2) Length of weir: 8 feet

(3) Crest elevation: 605.5

(4) Gates: Stoplogs to elev. 608.0

(5) U/S channel: Broad approach from pond

(6) D/S channel: Narrow stream channel

(7) General:

(j) Regulating Outlets

There are three outlet pipes from the spillway chamber and gate chamber. Flow from the spillway chamber exits through a 24 inch cast iron pipe drain and a 16 inch cast iron pipe drain both with invert elevations 585.0. This water is wasted into the downstream brook and there are no regulating valves.

In the gate chamber there are four gate valves, two for each intake line. One gate valve on each line controls intake water flowing back into the spillway chamber to be wasted. The other gate valve on each intake line controls water flowing into the 12 inch cast iron town supply line. The invert elevation of the supply line is 587.3. The gate valve on the low level intake is 16 inches. The other three gate valves are 12 inches.

SECTION 2 - ENGINEERING DATA

2.1 Design Records

The design records for this dam include plans and sections of the dam as well as piping details. There are also some calculations for the design of the piping system that is part of the spillway chamber. In addition, correspondence from Weston and Sampson, the design engineers, to the New Hampshire Public Service Commission describes some of the design considerations and construction specifications.

2.2 Construction Records

There is some correspondence in the files of the NHWRE regarding construction progress and some construction sequences.

2.3 Operational Records

There are no operational records available for the dam.

2.4 Evaluation

(a) Availability

Some of the original design drawings and calculations are available for the dam. No stability calculations are available, but some hydrologic/hydraulic calculations are available. An overall satisfactory assessment for availability is therefore warranted.

(b) Adequacy

The lack of in-depth engineering data does not permit a definitive review. Therefore, the adequacy of the dam cannot be assessed from the standpoint of reviewing design and construction data. This assessment is based primarily on the visual inspection, past performance, and sound engineering judgment.

(c) Validity

The available data agree to the extent verifiable with the observations of the inspection team. A satisfactory evaluation for validity is indicated.

SECTION 3 - VISUAL OBSERVATIONS

3.1 Findings

(a) General

Stockwell Brook Dam is in FAIR condition at the present time. The seepage observed at the downstream toe is the primary reason for the FAIR condition rating.

(b) Dam

(1) Earth Embankment

The crest of the dam is in good condition. There was no settlement noted, and the horizontal alignment was good. No cracks in the surface of the crest were noted, but considerable brush and high grass was noted (Photo 5).

The upstream face is sloped at 2.5 horizontal to 1 vertical and has a rock slope protection (over-view Photo). The rock slope is in good condition. A tree was observed in the slope near the right abutment.

The downstream face is sloped at 2 horizontal to 1 vertical. There are significant amounts of brush and saplings growing on the downstream slope (Photo 5). Sloughing was observed in the slope above the headwall outlets (Photo 3). This area is about 30 feet wide and seepage of 2 to 4 gpm was observed at the toe of the slope above the headwall (Photo 4). Seepage of 2 to 4 gpm was also observed at the toe to the right of the headwall. The seepage was clear. A scotch pine tree is located near the headwall. The roots of this tree are rotted.

(2) Spillway and Gate Chamber

The exterior of the chamber has some minor erosion (Photo 2), which is attributed to ice damage and moisture intrusion which has been subjected to alternating freeze and thaw cycles. This erosion is located at the exposed upstream face and sides of the structure from ground elevation to the high water level in the reservoir. The stop logs are in good condition, but the guides are rusted. The chamber interior is in good condition, but there is some minor surface spalling.

(3) Gate House

The gate house (Photo 1) is in good condition. The gate stem operating the 16 inch waste gate valve has buckled which indicates that there is excessive friction in the gate valve during opening and closing. Similar conditions, but to a lesser extent, were observed in the stem operating the 12 inch waste gate. The two water supply line gate stems need lubrication but are in good condition.

(4) Headwall

The headwall (Photo 3) is in good condition. There is some minor spalling of the concrete at the headwall.

(5) Intake Structures

The concrete and removable screen of the upper intake structure (overview Photo) are in good condition. The lower intake structure was submerged at the time of inspection and could not be observed.

3.2 Evaluation

Stockwell Brook Dam is in FAIR condition at the present time. Although all the appurtenant structures are in good condition, the downstream slope of the dam has some seepage, and sloughing of slopes has occurred. Brush and saplings are also growing out of the downstream slope. An upright tree with rotted roots is located near the headwall. The condition of the downstream slope is the reason for the FAIR evaluation for the condition of the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

No operational procedures are performed at the dam. The level of the dam fluctuates without control by the town during normal operation. The waste gates are normally closed and the water supply gates are normally open.

4.2 Maintenance of Dam

No major maintenance is performed at the dam. The screens for the intake structures are cleaned yearly, and the brush on the embankments is cut occasionally but not at regular intervals.

4.3 Maintenance of Operating Facilities

There is no established procedure for maintaining the operating facilities although the gates appear to be operable.

4.4 Description of Warning System

There is no formal warning system for the dam.

4.5 Evaluation

The dam is in need of some routine maintenance. In particular, the embankments need to be cleared of brush and saplings. The four gate valves need lubrication and should be maintained in good operating condition.

SECTION 5 - HYDRAULICS/HYDROLOGY

5.1 Evaluation of Features

(a) General

Stockwell Brook Dam is an earth embankment with a concrete core wall and a combination drop spillway and pipe outlet structure. The dam impounds the New Wilton Reservoir which serves as a secondary source of water supply to the town of Wilton. The drainage area is 0.4 square miles and is hilly, forested terrain. The time required to lower the reservoir level from the crest of the dam to the top of the stoplogs at elevation 608.0 assuming no inflow, would be 1.7 days of outflow through the spillway.

(b) Design Data

Data sources available for Stockwell Brook Dam include prior inventory and inspection reports. The New Hampshire Water Control Commission's "Data on Dams in New Hampshire" (September 26, 1939) and "Data on Reservoirs and Ponds in New Hampshire" (September 26, 1939); the Public Service Commission of New Hampshire's "Dam Record" (September 3, 1936); and the New Hampshire Water Resources Board's "Inventory of Dams and Water Power Developments" (August 27, 1936) and "Survey of Existing New Hampshire Dams" (August 11, 1937) provide some of the basic data for the dam. Inspection reports from June 10, 1940, July 12, 1951, September 26, 1967, and July 23, 1975 are also available.

In addition, correspondence dated in 1931 between the designers of the project and the New Hampshire Public Service Commission is available. This correspondence concerns the initial design, construction, and revised design of the dam. As-built drawings and design plans prepared by Weston and Sampson, the designers, are also on record.

(c) Experience Data

There is no data available on lake levels in the New Wilton Reservoir behind the Stockwell Brook Dam.

(d) Visual Observations

The crest of the dam is 123 feet long and meets a steeply sloping valley wall at the right abutment and an unpaved roadway lined by a low stone wall at the left abutment. To the left of the roadway, which is about 20 feet wide, the valley wall rises steeply.

Downstream of the dam, the Stockwell Brook channel is very steep and narrow for approximately 1 mile. This reach is heavily wooded with trees growing out of the banks. Beyond this reach the channel opens to an area of lower banks and milder slope for a length of about 500 feet before its confluence with Stony Brook.

Stony Brook is a larger stream which flows another 1.3 miles into Wilton where it joins the Souhegan River. For the first mile, Stony Brook follows a channel of straight alignment and very steep grade with high, steeply sloping banks and a streambed of cobbles and boulders. Further downstream, the high bank at the left moves back from the main channel, leaving a wider flood plain.

About 300 feet downstream of Stockwell Brook Dam, Stockwell Brook is crossed by a roadway embankment with an 18 inch diameter corrugated steel culvert. The roadway surface is not paved. Further downstream the banks are forested and uninhabited until nearly 1 mile downstream. After the stream channel has opened out, there is a house and trailer on the left bank with a first floor level about 8 feet above the streambed.

A few hundred feet downstream of its confluence with Stockwell Brook, Stony Brook is crossed by a railroad bridge. This bridge is roughly 22 + feet above the streambed with three 40 + foot wide openings. Approximately 1 mile downstream of Stockwell Brook a small, run-of-the-river dam structure has been built with a height of about 8 feet and an impoundment with a surface area of roughly 2 acres. Beyond the dam in the flood plain to the left of the stream, there are several houses with first floor levels approximately 6 feet above the streambed. Approximately one-quarter mile further downstream in Wilton, Stony Brook passes the Abbott Memorial Trust Dam before it joins the Souhegan River.

(e) Test Flood Analysis

The hydrologic conditions of interest in this Phase I investigation are those required to assess the dam's overtopping potential and its ability to safely allow an appropriately large flood to pass. This requires using the discharge and storage characteristics of the structure to evaluate the impact of an appropriately-sized Test Flood.

Guidelines for establishing a recommended Test Flood based on the size and hazard classifications of a dam are specified in the "Recommended Guidelines" of the Corps of Engineers. The impoundment of 335 acre feet and height of 24 feet classify this dam as a SMALL structure.

The hazard potential for the Stockwell Brook Dam is considered to fall within the SIGNIFICANT category. This is based mainly on the possibility of some damaging flooding at the houses 2 miles downstream along Stony Brook just outside of Wilton.

As shown in Table 3 of the Corps of Engineers' "Recommended Guidelines," the appropriate Test Flood for a dam classified as SMALL in size with a SIGNIFICANT hazard potential would be between the 100-year flood and one-half times the Probable Maximum Flood (PMF). Where a range of values is indicated for the Test Flood, the magnitude should be related to the hazard potential. Since the hazard is on the low side of the SIGNIFICANT category, the test inflow to the New Wilton Reservoir is the 100-year flood.

The magnitude of the 100-year flood has been estimated using three separate procedures. The first used the regression relation developed by Denis R. LeBlanc in the U.S.G.S. publication, Progress Report on Hydrologic Investigations of Small Drainage Areas in New Hampshire. The second used the rational formula, and the third assumes that the 100-year flood is equal to one-quarter PMF, as determined from the chart of "maximum Probable Flood Peak Flow Rates" obtained from the Corps of Engineers, New England District. By these methods, the 100-year peak inflow is estimated, respectively, to be 108 cfs, 307 cfs, and 250 cfs. The latter value of 250 cfs was used as the Test Flood inflow to the New Wilton Reservoir.

The procedure suggested by the Corps' of Engineers New England Division for "Estimating the Effect of Surcharge Storage on Maximum Probable Discharges" produces a Test Flood at the dam of 143 cfs. This flow includes the correction for storage in the pond. The storage-stage curve used to determine surcharge storage for these calculations is developed assuming that the surcharge storage available is equal to the lake area times the depth of surcharge. No spreading or increase of area with depth is considered.

The stage-discharge curve is developed by defining discharge as the sum of flow through the spillway/outlet structure, flow over the dam crest, and flow over the side slopes at the ends of the dam. The calculations determining these curves are documented in Appendix D.

If the stop logs are left at elevation 608.0, the peak test discharge of 143 cfs would result in a maximum stage of 1.9 feet above the stop log crest which would be 0.4 feet above the top of the dam. If the stop logs were removed to elevation 606.0, the maximum pool elevation would be 608.6 or 0.9 feet below the top of the dam. Therefore, the dam would not be overtopped during the Test Flood if stop logs were removed to elevation 606.0 or below.

A relevant hydraulic consideration is that the spillway/outlet configuration is susceptible to obstruction by ice, logs, or other debris. Such an obstruction would seriously reduce the outflow capacity of the dam during a flood.

The simplified analytical techniques used in this analysis are only approximate resulting in some uncertainty as to the magnitude of the appropriate Test Flood. It should be noted that the magnitude of the flood varied by a factor of 3 for the different methods of determining the 100-year flow. The outlet capacity of the dam may be reduced because of the possibility of obstruction. Since the evaluation of the dam is sensitive to these hydraulic and hydrologic uncertainties, a more detailed investigation is recommended.

(f) Dam Failure Estimates

The outflow that would result from a dam failure is estimated using the procedure suggested in the Corps of Engineers New England Division's April 1978 "Rule of Thumb Guidelines for Estimating Downstream Dam Failure Hydrographs." Failure is assumed to occur as soon as the dam crest is overtopped, at an elevation of 609.5 feet. This is 1.5 feet above the stoplog crest and some 23.5 feet above the streambed. Just prior to failure the normal outflow through the spillway would be 29 cfs. Assuming a 25 foot gap is opened in the dam, the peak failure outflow through this gap would be 4560 cfs.

This flow would overtop the roadway embankment 300 feet downstream of the dam, far exceeding the outlet capacity of the 18 inch culvert. As a consequence, this embankment would be seriously damaged if not completely destroyed.

Following essentially the "Rule of Thumb Guidelines," it is estimated that at the end of the 0.9 mile reach of steep, narrow channel, the flood peak would be attenuated to 4150 cfs. With a depth of flow estimated to be slightly less than 8 feet, the dam break flood wave should not cause serious damage to the house and trailer in this vicinity.

Along Stony Brook neither the railroad bridge nor the small dam further downstream should be jeopardized by the dam failure.

Using essentially the same storage routing technique as above, the attenuated peak flow component due to dam failure is estimated for a segment of Stony Brook about 1 mile downstream of Stockwell Brook to be 2600 cfs. This discharge is sufficient to cause serious flood damage to 5 to 10 houses in the flood plain along the left bank of the stream here (see p. D-17). Based on FIS profiles, flood depths of 10 feet might be expected, causing flooding at these houses up to 4 feet deep. This magnitude of flooding is comparable to a natural flood with a return period of between 10 and 50 years.

After further attenuation in the flood plain on the outskirts of Wilton and in the pond behind the Abbott Memorial Trust Dam in town, the flood wave resulting from the failure of the Stockwell Brook Dam probably would not be a hazard to the Abbott Dam or to other structures in the Town of Wilton.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

(a) Visual Observations

(1) General

The field investigation revealed no significant displacement or distress that would warrant preparation of structural stability calculations based on assumed sectional properties and engineering factors.

(2) Embankment

The upstream slope is stable and in good condition. A sapling growing in the slope near the right abutment should be removed. The crest of the dam is in good condition with no signs of distress, however, there are significant quantities of brush on the crest. The downstream slope has brush and saplings growing on it, and seepage was observed in two locations near the headwall. Sloughing of the embankment was also noted in these areas.

(3) Appurtenances

The appurtenant structures are all in good condition. There is some minor erosion or spalling on some concrete surfaces. The gates are operable. At least two gates appear to be operated with some difficulty.

(b) Design and Construction Data

The plans and calculations available for this dam are of minimal use to a stability assessment. The geometry of the dam appears to be accurate, but the soil parameters to be used in a stability assessment are not known.

(c) Operating Records

There are no known operating records for the dam.

(d) Post Construction Changes

The records do not indicate any post construction changes.

(e) Seismic Stability

The dam is located in Seismic Zone No. 2 and, in accordance with the recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

(a) Condition

Stockwell Brook Dam is in FAIR condition at the present time.

(b) Adequacy of Information

The lack of in-depth engineering data does not permit a definitive review. Therefore, the adequacy of the dam cannot be assessed from the standpoint of reviewing design and construction data. This assessment is based primarily on the visual inspection, past performance, and sound engineering judgment.

(c) Urgency

The recommendations and improvements contained herein should be implemented by the owner within one year of receipt of this Phase I report. The stoplogs should be removed immediately to elevation 606.0 or lower until all the recommendations and improvements have been implemented.

(d) Need for Additional Investigations

Additional investigations should be performed by the owner as outlined in paragraph 7.2 below.

7.2 Recommendations

It is recommended that a registered professional engineer specializing in geotechnical engineering be retained to investigate the seepage at the toe of the downstream toe.

It is recommended that a registered professional engineer be retained to perform hydrologic and hydraulic analyses to improve the discharge capacity at the dam.

It is also recommended that the reservoir be lowered to allow inspection of the lower intake structure by a registered professional engineer.

The stoplogs should be removed to elevation 606 or lower immediately and should not be replaced above this level until the findings of all of the above studies and remedial measures are implemented.

7.3 Remedial Measures

It is recommended that the following remedial measures be performed at the dam:

- (a) Remove the pine trees at the headwall and its roots. Fill in resulting holes with suitable, well compacted fill.
- (b) Service the 4 gate valves in the gate house.
- (c) Trim and remove brush and trees (and their roots) from the embankment. Fill in resulting holes with suitable well compacted fill.
- (d) Prepare a formal written warning procedure to alert downstream people in the event an emergency arises.
- (e) Institute a program of annual technical inspections.
- (f) Repair spalled concrete on the gate chamber and headwall.
- (g) Install a log boom to prevent debris from clogging or blocking the spillway.

7.4 Alternatives

There are no meaningful alternatives to the above recommendations.

APPENDIX A
VISUAL INSPECTION CHECKLIST

INSPECTION TEAM ORGANIZATION

Date: November 8, 1978

NH 00261
STOCKWELL BROOK DAM
Wilton, New Hampshire
Stockwell Brook
NHWRB No. 254.09

Weather: Overcast. 55° F ±

INSPECTION TEAM

Nicholas Campagna	Goldberg, Zoino, Dunnicliff & Associates, Inc. (GZD)	Team Captain
Robert Minutoli	GZD	Soils
Andrew Christo	Andrew Christo Engineers (ACE)	Structural
Paul Razgha	ACE	Concrete
Guillermo Vicens	Resource Analysis, Inc.	Hydrology

Pattu Kesavan of the New Hampshire Water Resources Board
accompanied the inspection team.

CHECK LISTS FOR VISUAL INSPECTION

AREA EVALUATED	BY	CONDITION & REMARKS
DAM		
Crest elevation	NAC	609.5
Current reservoir level		600
Maximum reservoir level		Unknown
Surface cracks		None noted, considerable brush and high grass
Movement or settlement of crest		None noted
Vertical alignment		Good
Horizontal alignment		Good
Condition of abutments and concrete structure		Good
Indications of movement of structural items on slope		None noted
Trespassing on slopes		Brush and saplings growing on downstream slope
Sloughing or erosion of slopes		Sloughing of downstream toe of slope above outlet headwall. Area about 30 ft. wide and 4 ft. high is soft and wet
Rock slope protection		Good; one tree in upstream slope near the right abutment
Unusual movement or cracking at or near toe		Slough above outlet headwall (see above)
Unusual embankment or downstream seepage	NAC	Seepage of 2 to 4 gpm at the toe above the outlet headwall seepage of 2 to 4 gpm at toe to right of headwall

CHECK LISTS FOR VISUAL INSPECTION

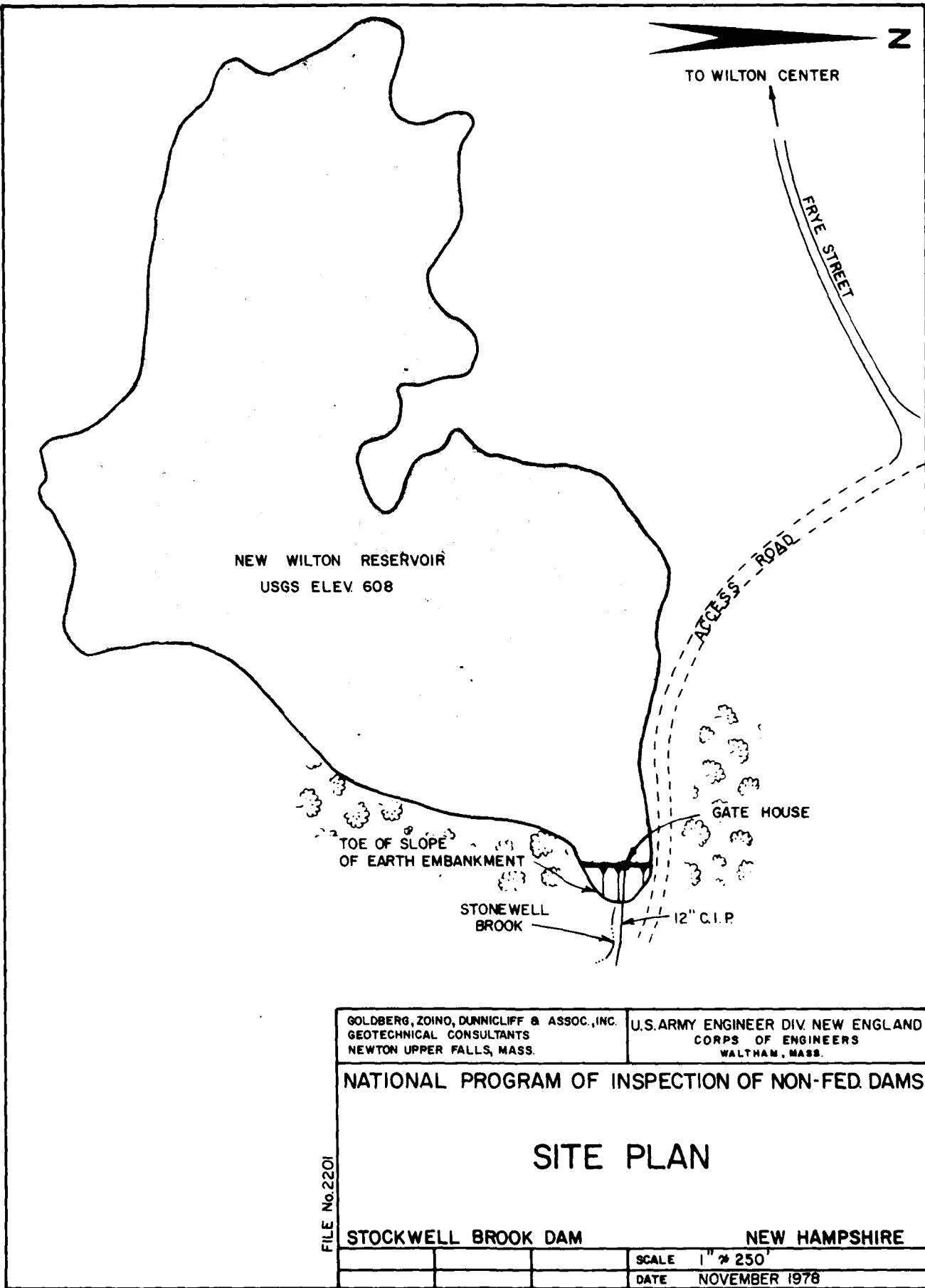
AREA EVALUATED	BY	CONDITION & REMARKS
Piping or boils	RM	Seepage is clear
Foundation drainage features		Unknown
Toe drains	RM	Unknown
OUTLET WORKS		
A. Spillway and Gate Chamber		
Building structure	AC	No deficiencies noted
Condition of concrete		Good
Spalling		Minor on interior face of spillway structure
Erosion		Minor on upstream and side faces of spillway structure
Cracking		None noted
Rusting or staining of concrete		None noted
Visible reinforcing		None noted
Efflorescence		None noted
Stop logs		No deficiencies noted
Stop log guides		Surface rust
Gate operating stems		Stem for 16" waste gate buckled. Stem for 12" waste gate buckled to lesser extent
Water supply gates and stems		Lacking lubrication
Downstream concrete headwall	AC	No deficiencies noted with the exception of minor surface spalling

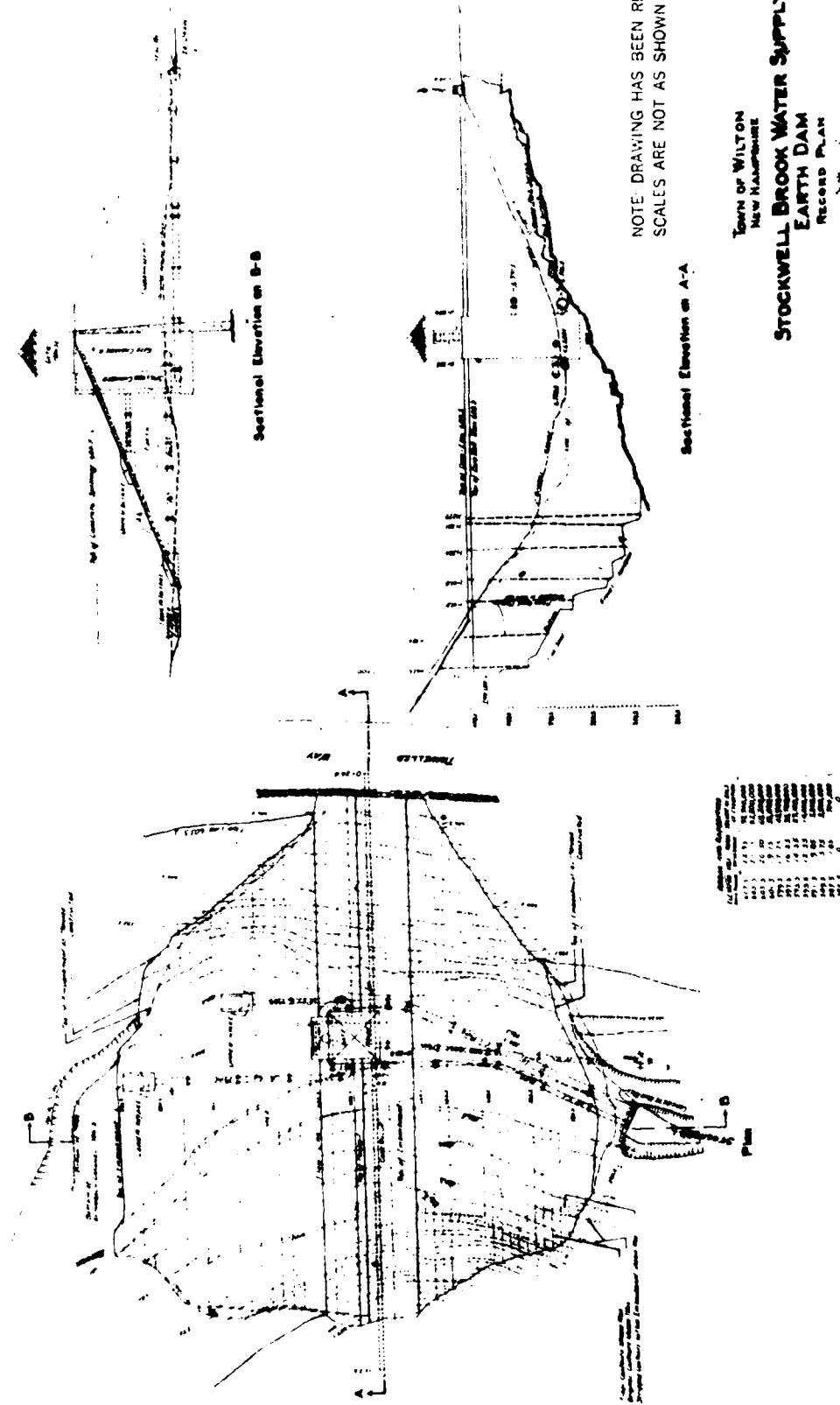
CHECK LISTS FOR VISUAL INSPECTION

AREA EVALUATED	BY	CONDITION & REMARKS
B. Reservoir Intake Structures		
High level structure	PR	Concrete and removeable screen in good condition
Low level structure	PR	Submerged
RESERVOIR		
Shoreline	MAC	Stable, no evidence of slides
Sedimentation		Deep water behind dam, none noted
OUTLET CHANNEL		
Channel bottom		Earth, narrow stream channel
Trees overhanging channel	WAE	Pine tree being undermined at outlet structure headwall

APPENDIX B

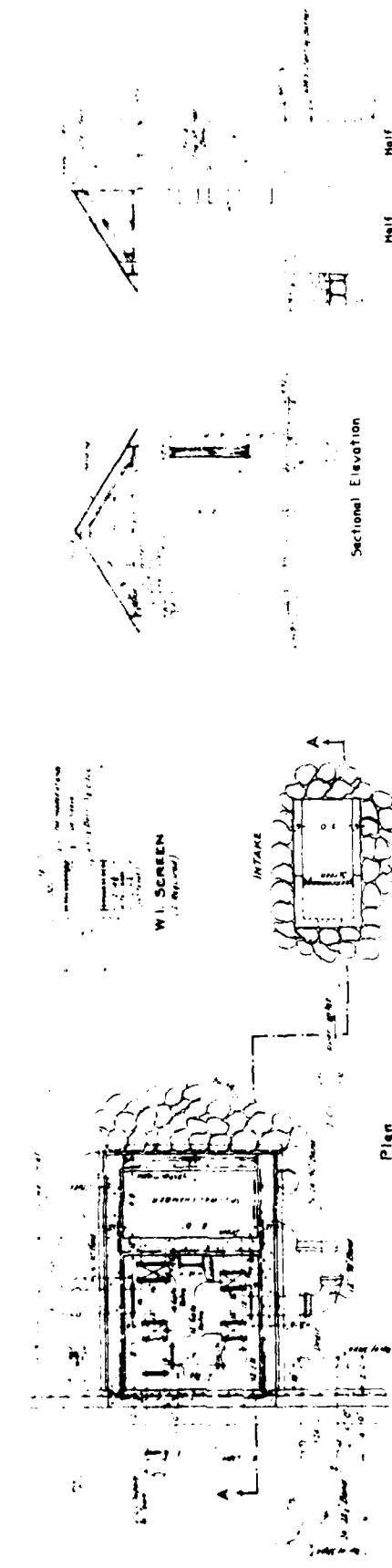
	<u>Page</u>
FIGURE 1 Site Plan	B-2
Plan and Section of Dam	B-3
Gate Chamber and Spillway Chamber	B-4
Piping Plan	B-5
List of Pertinent Data Not Included and Their Location	B-6



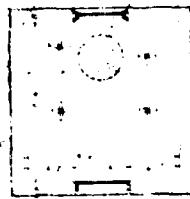


20
TOWN OF WILTON
New Hampshire
STOCKWELL BROOK WATER SUPPLY
EARTH DAM
Record Plan
Scale 1:1000
November 1951

b-3

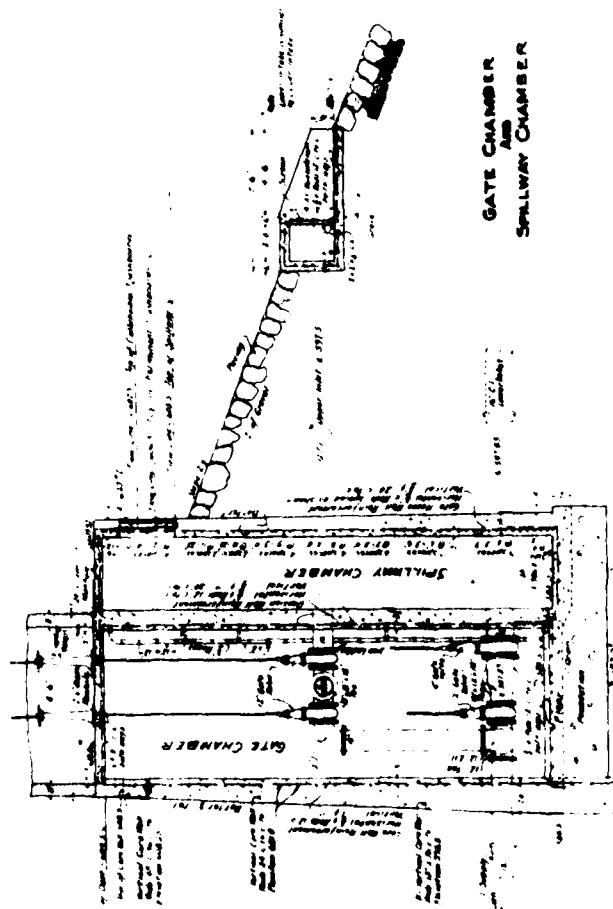


Sectional Elevation



100

GATE HOUSE



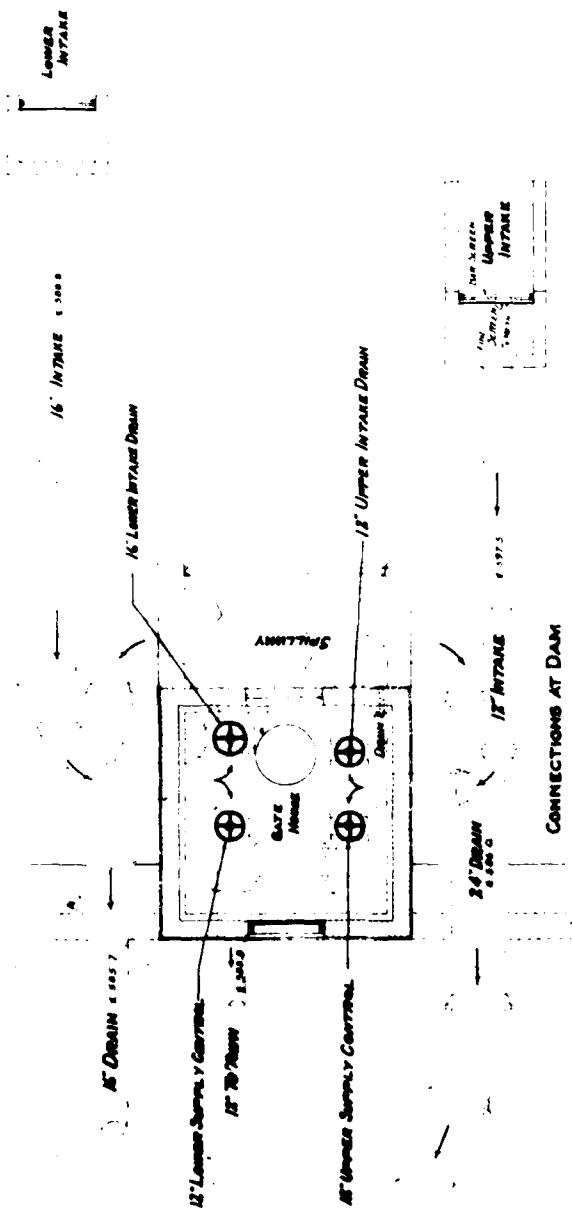
Sectional Literature on A-A

NOTE: DRAWING HAS BEEN REDUCED
SCALES ARE NOT AS SHOWN

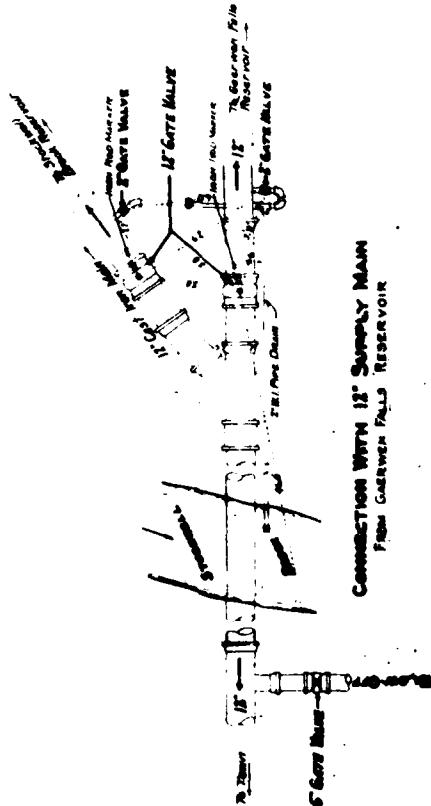
TOWN OF WILTON
New Hampshire

STOCKWELL BROOK WATER SUPPLY
GATE, CHAMBER, GATE, HOUSE ETC.

May, 1951
The Reserve Document, 1951



Connections At Dam



CONNECTION WITH 12' SUPPLY MAIN
From Garonne Flume RESERVOIR

TOWN OF WILTON

NOTE DRAWING HAS BEEN REDUCED
SCALES ARE NOT AS SHOWN

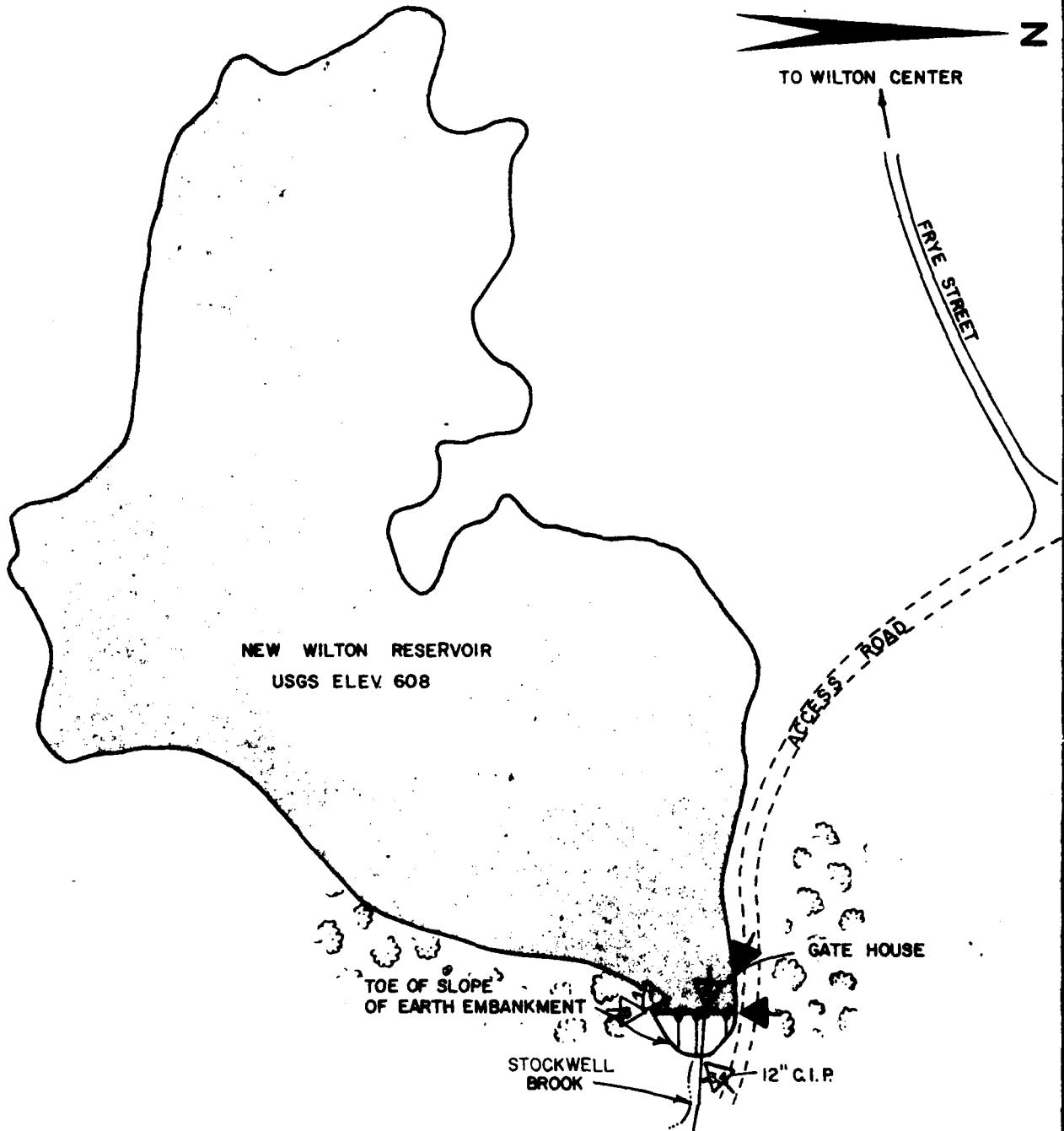
WILLIAM G. BROWN
Consulting Engineer
Benton, New
Hampshire

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The New Hampshire Water Resources Board (NHWRB) located at 37 Pleasant Street, Concord, N.H. 03301 maintains a file on this dam including design drawings, as-built drawings, calculations, and correspondence. Some of the items in this file are:

- 1) Inspection reports dated June 10, 1940; July 12, 1951; September 26, 1967; and July 23, 1975.
- 2) The New Hampshire Water Control Commission's "Data on Dams in New Hampshire" (September 26, 1939) and "Data on Reservoirs and Ponds in New Hampshire" (September 26, 1939).
- 3) The NHWRB's "Inventory of Dams and Water Power Developments" (August 27, 1936) and "Survey of Existing New Hampshire Dams" (August 11, 1937).
- 4) Correspondence between the design engineers and the New Hampshire Public Service Commission concerning initial design, revised design, and construction of the dam.

APPENDIX C
SELECTED PHOTOGRAPHS



GOLDBERG, ZOINO, DUNNCLIFF & ASSOC., INC. GEOTECHNICAL CONSULTANTS NEWTON UPPER FALLS, MASS.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.
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NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND ORIENTATION
OF PHOTOS

FILE No. 2201

STOCKWELL BROOK DAM

NEW HAMPSHIRE

SCALE 1" = 250'
DATE NOVEMBER 1978

- OVERVIEW
- APPENDIX C



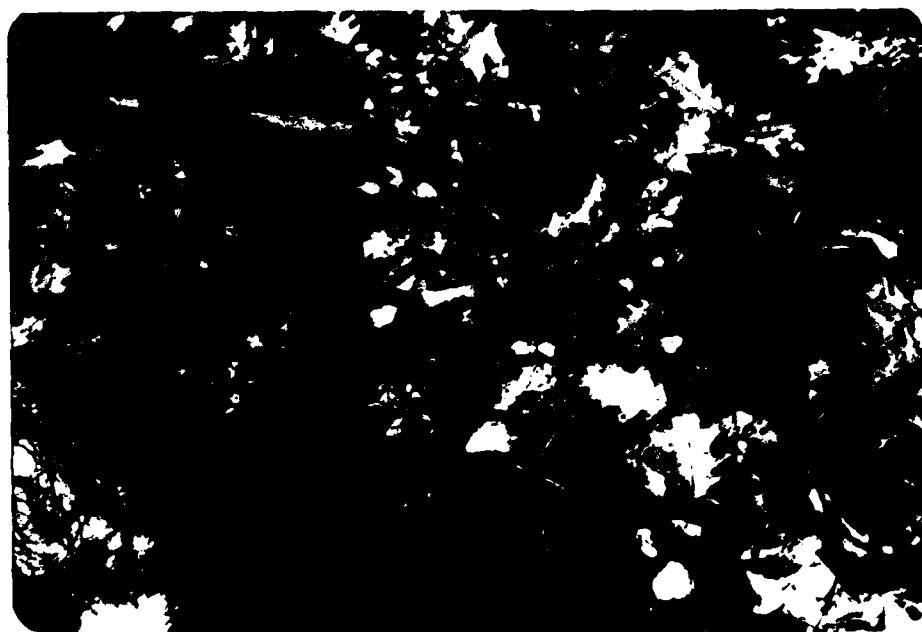
1. View from right abutment showing slope protection on upstream side of dam



2. View of spillway structure showing surface erosion and cracking of concrete



3. View from downstream showing headwall
with two discharge pipes



4. View from downstream channel showing typical
seepage through toe of embankment



5. Overview of dam from right abutment

APPENDIX D
HYDROLOGIC/HYDRAULIC COMPUTATIONS

1-5 Dam Safety Stockwell Brook CHF 3/15/29 1/1

I Dam Rating Curve

See page 2 for schematic sketch of spillway/outlet and dam overflow section based on the 1931 Record Plan by Weston & Sampson and recent inspection at the site. It is assumed that stop logs are permanently in place 2.5 feet above the spillway crest. (This is the present condition.)

At high pool elevations, flow entering the spillway will be constricted at the upper nappe by the concrete platform over the spillway. It will then be considered orifice flow. To see which situation controls, the computation will try both cases and retain the smaller discharge value. It will also check to see if the discharge capacity of the outlet pipes is controlling.

Datum -- Top of Stoplogs elev. 608.0

Spillway Orifice

$$Q = C \cdot L_{off} \cdot H^{3/2}$$

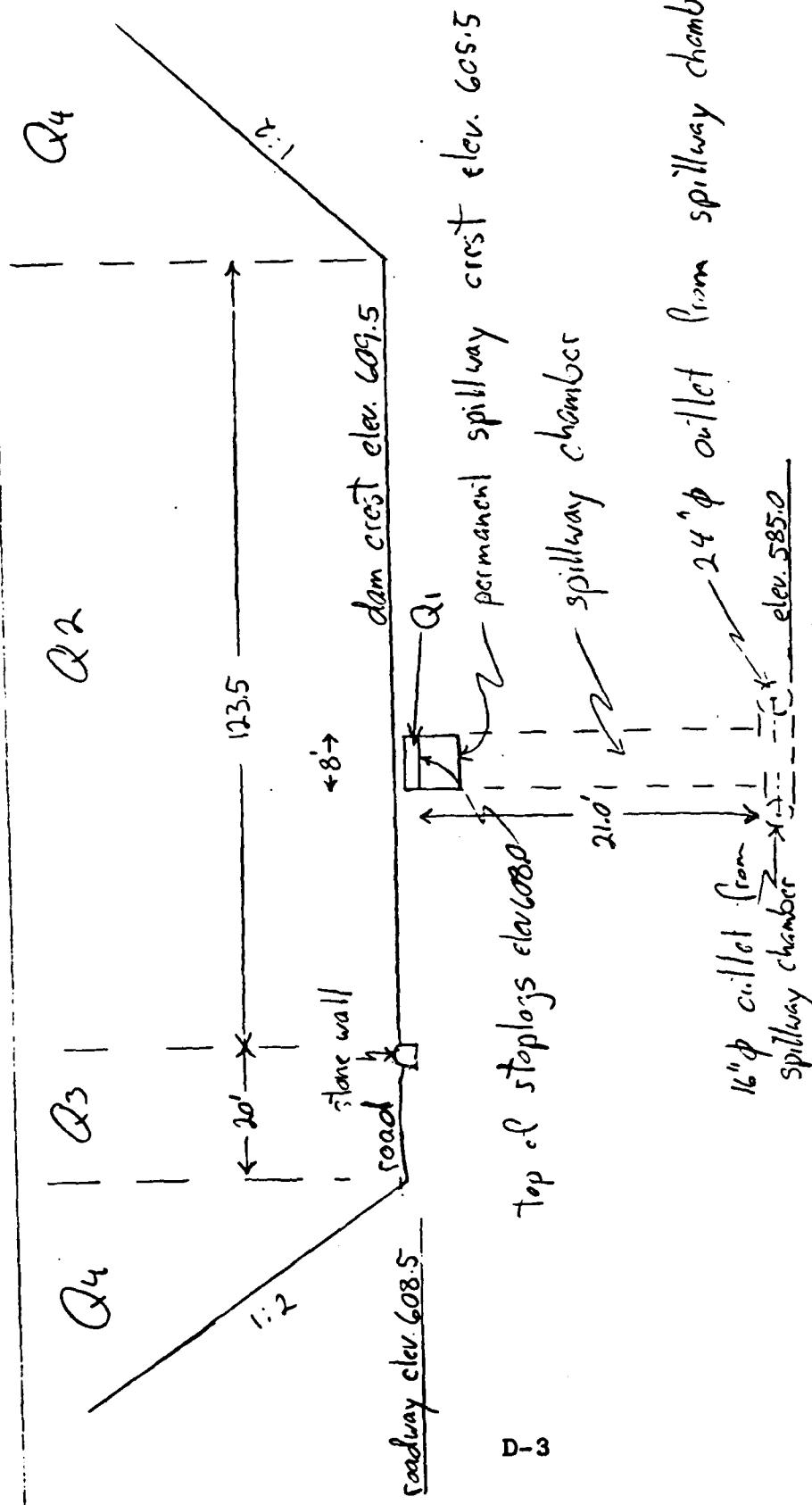
$C = 3.3$ (weir coefficient)

$$L_{off} = 8 - 2H \quad (\text{Henderson, Open Channel Flow})$$

H = head on crest defined as top of stoplogs

$$Q = 3.3 \times (8 - 2H)^{D-2} \times H^{1.5}$$

1-5 Dam Safety Stockwell Br. Dam ^{RHF} 3/15/79 2/42

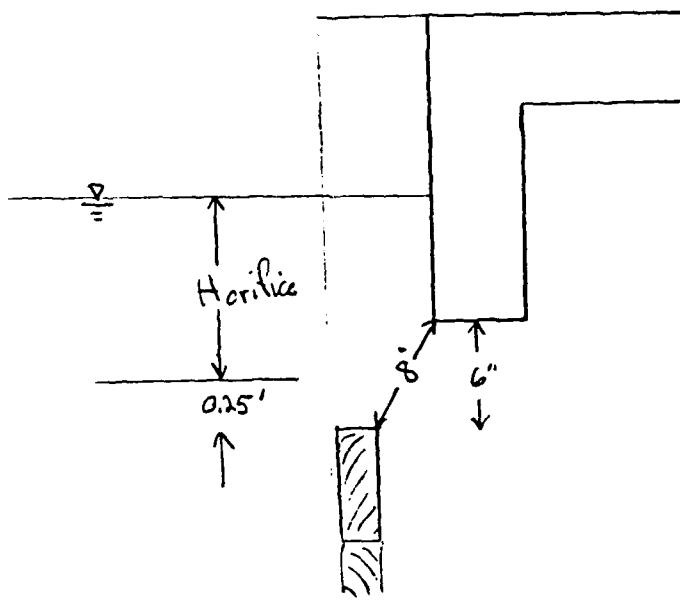


Schematic Overflow Section (looking d/s)

Stockwell Brook Dam

165 Dam Safety Stockwell Brook RHF 3/15/77 3/42

Orifice Flow at Spillway Entrance



$$Q_{orifice} = C A \sqrt{2g H_{orifice}}$$

$$C = 0.6$$

$$A = 8 \times 8/2 = 5.33^2$$

$$H_{orifice} = H - 0.25$$

$$Q_o = 0.6 \times 5.33 \times \sqrt{2g(H - 0.25)}$$

165 Dam Safety Stockwell Brook 3/15/79 RHF 4/42

Outlet Pipe Discharge

Assume a constant tailwater at the pipe exit to the crown of the 24" pipe* -- elev 582.

$$Q_{24} = A \sqrt{2g H_T / k_L} \quad (\text{BuRec, Design of Small Dams, p. 471})$$

$$A = 3.14 r^2 \quad (\text{area of pipe})$$

$$H_T = H + 21.0 \quad (\text{total head above tailwater})$$

$$k_L = k_f + k_{ent} + k_{ex} \quad (\text{head loss coefficients})$$

$$k_f = 29.1 n^2 L / r^{4/3} \quad (\text{pipe friction})$$

$$n = .015$$

$$L = 70'$$

$$r = 1$$

$$k_f = 29.1 \times .015^2 \times 70 / 1 = .46$$

$$k_{ent} = 0.6 \quad (\text{entrance loss})$$

$$k_{ex} = 1 \quad (\text{exit loss})$$

$$k_L = .5 + 1 + .6 = 2.1$$

$$Q_{24} = 3.14 \sqrt{2g (H + 21.0) / 2.1}$$

$$Q_{16} = A \sqrt{2g H_T / k_L}$$

$$A = 2/3^2 \times 3.14 = 1.41^2$$

$$H_T = H + 21.0$$

* Tailwater maintained by channel obstruction - of sticks

165 Dam Safety Stockwell Brook

12 HF
3/15/75

5/42

$$k_L = .7 + 0.6 + 1 = 2.3$$

$$k_f = 23.1 + n^2 \cdot L / r^{4/3}$$

$$n = .015$$

$$L = 65'$$

$$r = .67$$

$$k_f = 23.1 + .015^2 \cdot 65 / .67^{4/3} = .73$$

$$k_{ent} = 0.6$$

$$k_{ex} = 1$$

$$Q_{16} = 1.4 \sqrt{2g H_T / 50}$$

$$Q_{outlet} = Q_{16} + Q_{24}$$
$$= 1.4 \sqrt{2g (H + 21.0) / 2.1} + 3.1 \sqrt{2g (H + 21.0) / 2.1}$$

Spillway/Outlet Combination

Use smaller of spillway overflow, orifice flow, and outlet pipe discharge values.

Dam Overflow

$$Q_s = CL H_3^{3/2}$$

$$C = 2.8$$

$$L = 123.5$$

$$H_3 = H - 1.5$$

$$Q_s = 2.8 \times 123.5 \times (H - 1.5)^{1.5}$$

Road way

$$Q_4 = 2.8 \times 20 \times (H - 1.5)$$

Side Slopes

$$Q_5 = 2 \times 2.8 \times 2(H - 1.5) \times (.5(H - 1.5))^{1.5}$$

Water Supply Intakes

Assume that withdrawals are negligible.

A simple BASIC program was written to calculate an aggregate stage-discharge function at the dam. A listing is shown on page 7, followed by tabulated output and a plotted curve.

Note that for $H \leq 0.75'$ weir flow controls, while at higher elevations orifice flow controls. Spillway/outlet capacity is not limited by the drain pipes.

11.12

```

LIST REMARK: STORED ON TAPE 18, FILE 52
110 REMARK: STAGE-DISCHARGE FUNCTION FOR WILTON DAM
111 DIM B$(1)
120 PAGE
130 PRINT "DISCHARGE FROM STOCKWELL BROOK DAM"
140 PRINT USING 150:
150 IMAGE /2T"HEAD"30T"DISCHARGE"
160 PRINT USING 170:
170 IMAGE 1T"(FEET)"32T"(CFS)"
180 PRINT USING 190:
190 IMAGE 10T"TOTAL CONTROL SPILLWAY DAM CREST SIDE SLOPES"
200 FOR H=0 TO 5 STEP 0.25
210 Q0=3.3*(8-0.2*H)*H^1.5
220 Q1=1.4*(2*32.2*(H+21)/2.3)^10.5+3.1*(2*32.2*(H+21)/2.1)^0.5
221 N=Q1<Q0
222 N=1
230 Q1=00 MIN Q1
235 Q2=0
240 Q3=0
250 Q4=0
260 Q5=0
270 IF H<=0.5 THEN 310
274 Q0=0.6*5.33*(2*32.2*(H-0.25))^0.5
275 N=Q1<Q0
276 Q1=Q0 MIN Q1
277 IF H<=1.5 THEN 310
280 Q2=2.8*123.5*(H-1.5)^1.5
290 Q3=2.8*28*(H-1.5)^1.5
300 Q4=2*2.8*2*(H-1.5)*(0.5*(H-1.5))^1.5
310 Q5=Q3+Q4
320 Q6=Q1+Q2+Q5
321 IF N=0 THEN 327
322 IF H=0 THEN 325
323 LET B$="P"

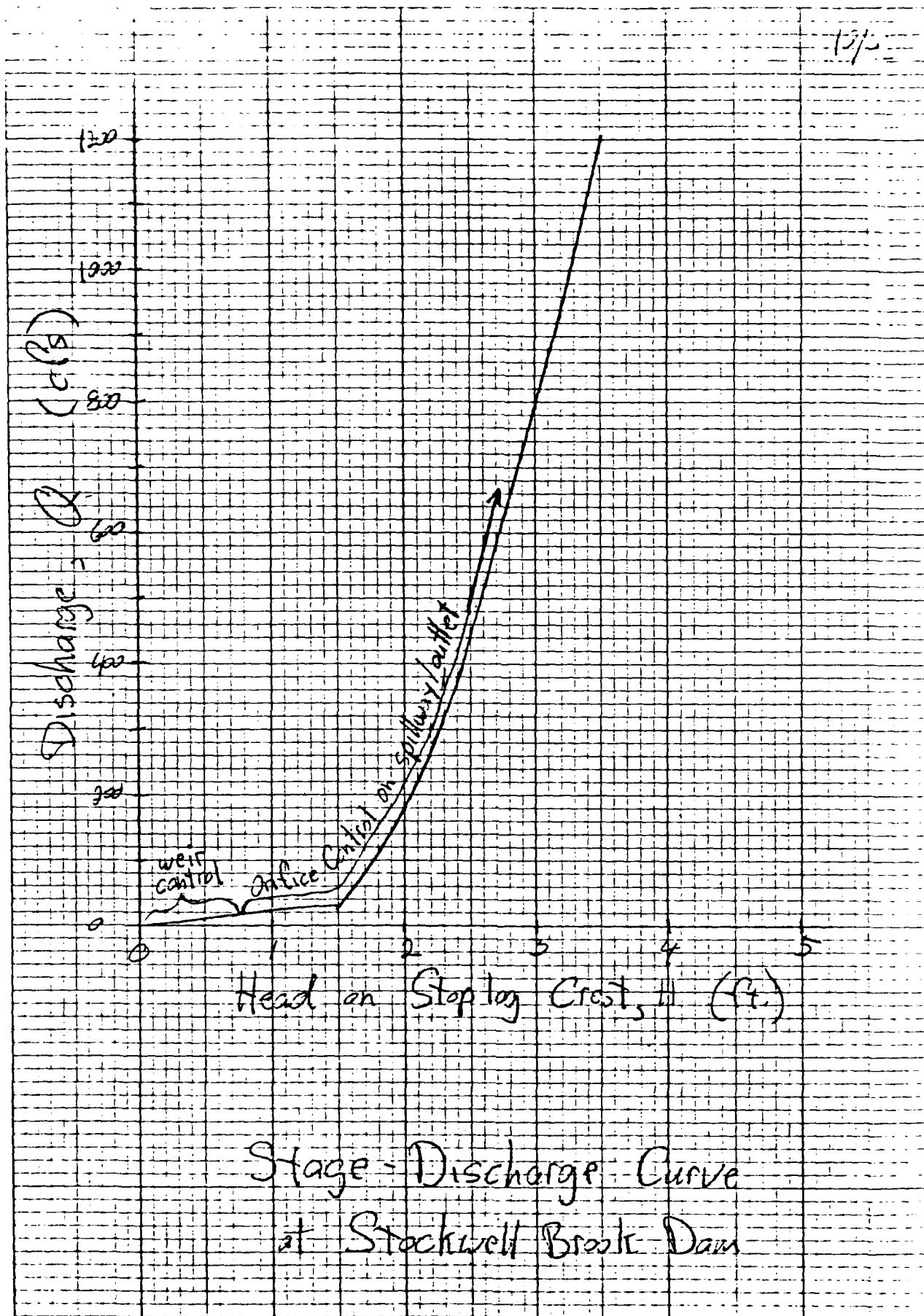
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```
324 GO TO 338
325 LET B$="H"
326 GO TO 329
327 LET B$="O"
328 PRINT USING 340:H, Q6, B$, Q1, Q2, Q5
329 IMAGE 2T, 2D, 9D, 5X, 1A, 2X, 10D, 11D, 13D
330 NEXT H
331 END
```

DISCHARGE FROM STOCKWELL BROOK DAM

HEAD (FEET)	TOTAL DISCHARGE (CFS)	CONTROL WEIR	DISCHARGE (CFS) SPILLWAY	DAM CREST	SIDE SLOPES
0.00	0.00	0.00	0.00	0.00	0.00
0.25	12.26	2.26	2.26	2.26	2.26
0.50	22.26	2.26	2.26	2.26	2.26
0.75	32.26	2.26	2.26	2.26	2.26
1.00	42.26	2.26	2.26	2.26	2.26
1.25	52.26	2.26	2.26	2.26	2.26
1.50	62.26	2.26	2.26	2.26	2.26
1.75	72.26	2.26	2.26	2.26	2.26
2.00	82.26	2.26	2.26	2.26	2.26
2.25	92.26	2.26	2.26	2.26	2.26
2.50	102.26	2.26	2.26	2.26	2.26
2.75	112.26	2.26	2.26	2.26	2.26
3.00	122.26	2.26	2.26	2.26	2.26
3.25	132.26	2.26	2.26	2.26	2.26
3.50	142.26	2.26	2.26	2.26	2.26
3.75	152.26	2.26	2.26	2.26	2.26
4.00	162.26	2.26	2.26	2.26	2.26
4.25	172.26	2.26	2.26	2.26	2.26
4.50	182.26	2.26	2.26	2.26	2.26
4.75	192.26	2.26	2.26	2.26	2.26
5.00	202.26	2.26	2.26	2.26	2.26

7/42



Stage-Discharge Curve
at Stockwell Brook Dam

165 Dam Safety Stockwell Brook

^{ZHF}
3/15/77

11/42

Stage-Storage Function for New Witten Reservoir

Pool to stoplog crest

$$Vol = 300 \text{ acre-ft}$$

$$\text{Surface Area} = 23 \text{ acres}$$

Assuming no spreading, storage volumes at higher pool elevations are estimated by

$$Vol = (H-2) \times 23 + 300$$

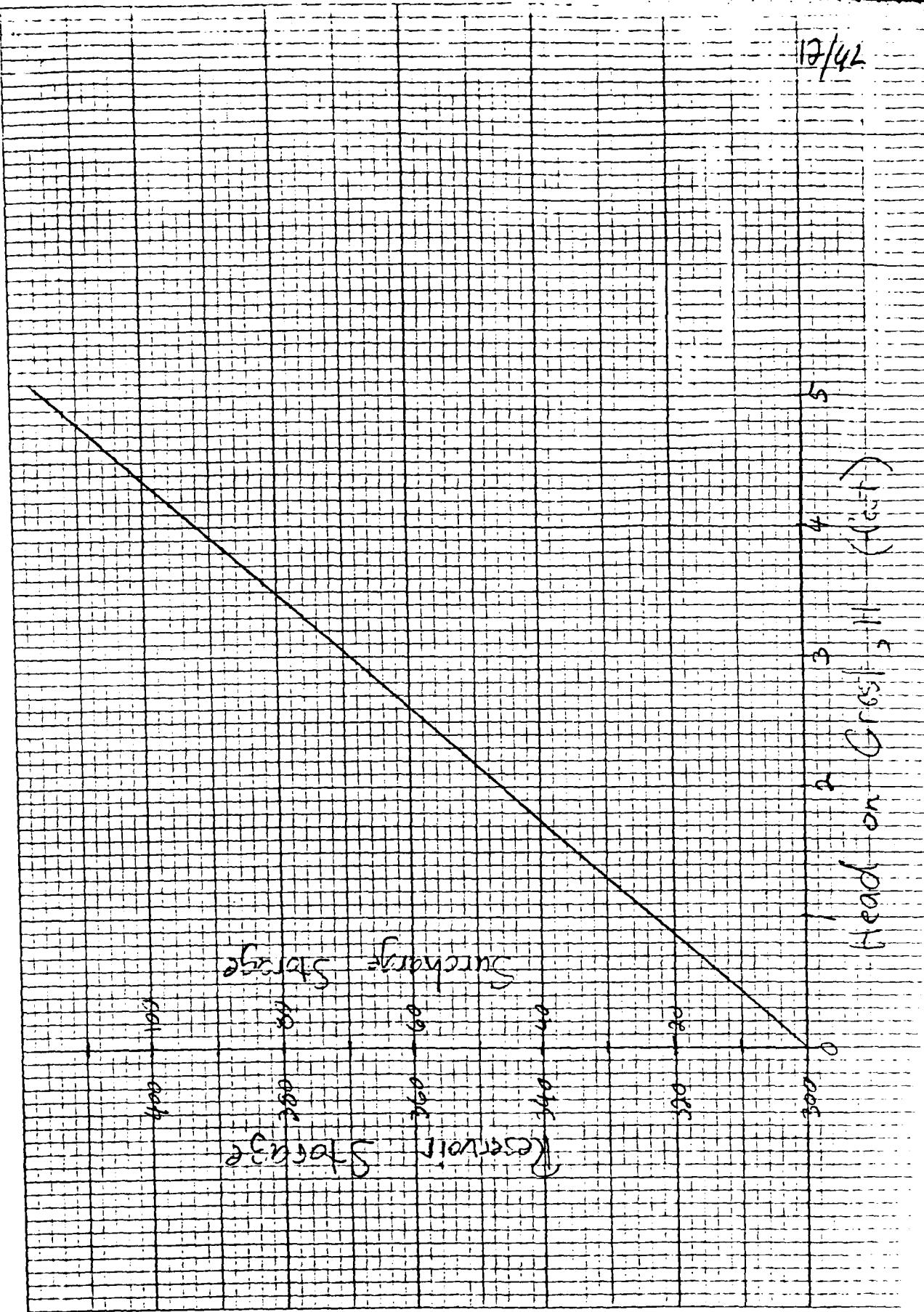
H = head on spillway crest

a stage-storage plot is shown on the following pg.

12/42

5
4
3
2
1
Head on Grass

Surcharge
Stage
Water
Level
Reservoir Stage



165 Dam Safety Stockwell Brook ^{RNF} 3/15/77 13/42

II Dam Failure analysis

Outflow at Failure = Outflow through breach
+ Normal outflow at failure elev.

Assume that dam fails when it is overtopped
-- elev. 609.5

Normal Outflow

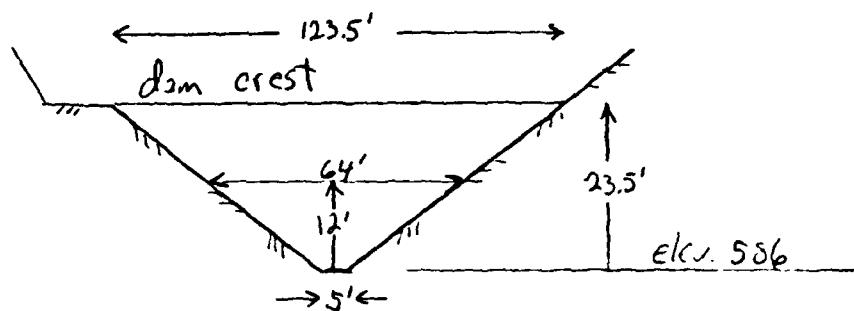
$$Q_{\text{normal}} = 29$$

Breach Outflow

$$Q_{\text{p1}} = \frac{8}{27} \times W_b \times \sqrt{3} \times \gamma_0^{3/2}$$

W_b = width of breach

$\leq .4 \times (\text{width of dam at } \frac{1}{2} \text{ height})$



$$\text{use } W_b = .4 \times 64 = 25'$$

165 Dam Safety Stockwell Brook ^{RHF} 3/15/27 14/42

$$Y_o = 699.5 - 587.0 = 22.5' \quad \begin{matrix} \text{(height from} \\ \text{top of pool to tail-} \\ \text{water at failure)} \end{matrix}$$

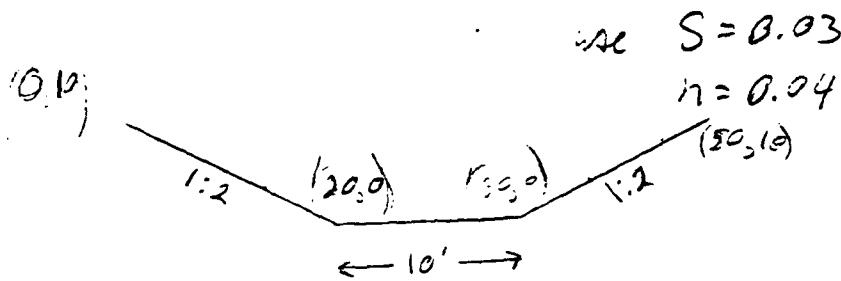
$$Q_{pi} = 8/27 \times 25 \times \sqrt{9} \times 22.5^{3/2} = 4490 \text{ cfs}$$

Total Outflow

$$Q_{tot} = 4490 + 30 = 4520 \text{ cfs}$$

III Downstream Flooding
Estimate Peak Flow 1 mile d/s

follow CCE "Rule of Thumb" Guidance for
Estimating Downstream Dam Failure Hydrographs"



Representative section of Stockwell Brook d/s of dam

A simple BASIC program was used to calculate a rating table based for this reach on the representative section sketched above. The table is shown on the following page.

Storage in Reach vs. Outflow (Q_{p2})

Assume channel storage equal to avg. of us flow area (known) and d/s flow area (function of reach outflow) times the reach length

$$Vol = \left(\frac{A_1 + A_2}{2} \right) \times L$$

$$L = 5300'$$

$$A_1 = 245 \text{ } \text{ft}^2 \text{ (from stream rating w/Qp1 = 455 cfs)}$$

$$A_2 = f(Q_{p2}) \text{ (use stream rating table)}$$

1642

800

STOCKWELL BROOK AND STONY BROOK
DOWNSTREAM OF STOCKWELL BROOK DAM
WILTON, NEW HAMPSHIRE
SCALE 1"=2266'

HOUSE AND TRAILER

STOCKWELL BROOK
DAM

HOUSES 6+ FEET
ABOVE STREAMBED

5/6 800

Scale 1"-2266'

WESTON & SAMPSON

17/42

HYD-R 0.4 ରୁଗ୍ବୁରୁଷ ରୁଗ୍ବୁରୁଷ ରୁଗ୍ବୁରୁଷ ରୁଗ୍ବୁରୁଷ

WIPER @ 2010-07-04 14:48:45 - 2010-07-04 14:48:45

AREA ഒരു തൊഴിൽ കേന്ദ്രമായി മാറ്റപ്പെട്ട ഒരു പ്രദേശമാണ്.

କଥାରେ କଥାରେ କଥାରେ କଥାରେ କଥାରେ କଥାରେ କଥାରେ କଥାରେ

STOCKWELL BROOK
D-S OF WILTON DAM

STREAM RATING

165 Dam Safety Stockwell Brook ^{7 ft} 3/15/77 18/42

Channel Storage vs. Outflow

Q_{p2}	D_2	A_2	Vol (AF)
875	4.0	72	19
1370	5.0	100	21
2000	6.0	132	23
2760	7.0	168	25
3680	8.0	203	28
4560	8.8	245	30

Peak Outflow from Reach

$$Q_{p2} = Q_{p1} \left(1 - \frac{Vol}{S}\right)$$

$$Q_{p1} = 4560 \text{ cfs}$$

$$S = 346 \text{ AF} \quad (\text{Vol. behind dam, see stage-storage curve p. })$$

$$Q_{p2} = 4560 \left(1 - \frac{Vol}{346}\right)$$

$$Vol = 346 \left(1 - \frac{Q_{p2}}{4560}\right)$$

$$\text{guess } Q_{p2} = 4000$$

$$\Rightarrow Vol = 346 \left(1 - \frac{4000}{4560}\right) = 42.5$$

$$\Rightarrow Q_{p2} \geq 4560 \quad (\text{from Channel Storage vs. Outflow Table above})$$

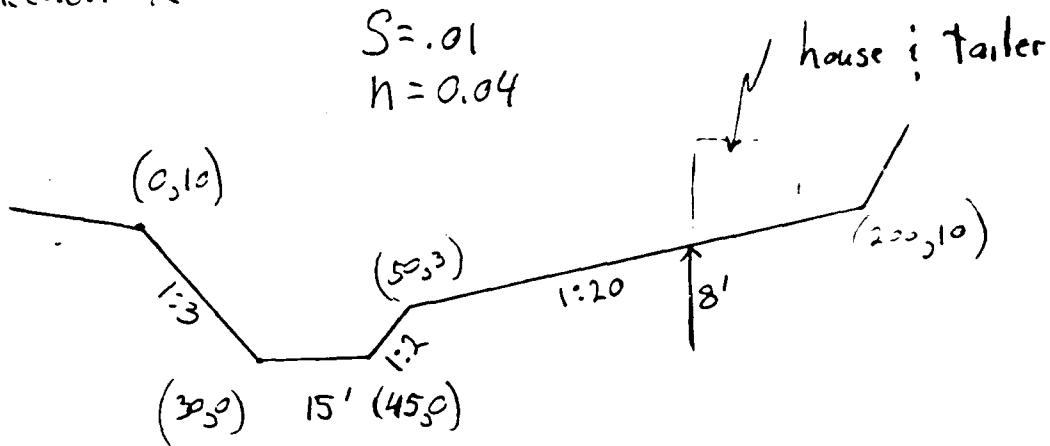
$$\text{guess } Q_{p2} = 4100 \Rightarrow Vol = 35 \quad (\text{flow Table above})$$

$$\text{guess } Q_{p2} = 4200 \Rightarrow Vol = 27$$

$Q_{p2} = 4150 \text{ cfs}$

Reach 2

$$S = .01$$
$$n = 0.04$$



Approx. Section at Building $\sim 1^+$ mile
d/s of dam (looking u/s)

Check flooding at house & trailer

A rating table^{of uniform flow} was calculated based on section sketched above of the reach from 1 mile d/s of the dam to the confluence in Stony Br. The table is shown on the following page.

$$Q = 4150 \text{ cfs}$$

$$\Rightarrow \text{Flood depth} \approx 7.9'$$

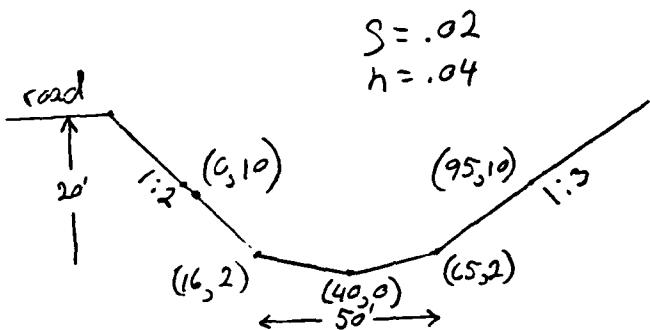
These structures should escape serious flooding.

20/42

STOCKWELL BROOK
ONE MILE D/S OF DAM

STATEMENT PERTAINING

Reach 3 Stony Brook

Length \approx 1 mile

Approx. Section of Stony Br.
d/s of Stockwell Br.

An approximate rating table for this reach
of Stony Br. extending about 1 mile d/s of
the confluence with Stockwell Br. is shown on the
following page.

22/42

Q	0.0	0.4	0.6	0.6	0.7	0.8	0.9	0.6	0.4	0.7	0.4	0.4	0.5	0.8	0.3	0.1	0.4
	6.0	6.6	6.6	6.7	6.7	6.8	6.9	6.9	6.6	6.7	6.7	6.7	6.8	6.8	6.3	6.1	6.4
	4.0	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.7	4.7	4.7
	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7
	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5
	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0
	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7
	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0

AR2/3	0.27	0.07	0.49	0.65	0.74	0.09	0.26	-0.13
	1.77	0.93	0.45	0.57	0.47	0.10	0.24	0.19
	2.28	1.58	1.18	1.98	1.63	1.10	1.34	1.49
	2.48	1.93	1.29	2.00	1.67	1.16	1.52	1.92
	2.97	2.18	2.98	3.00	2.67	2.19	2.71	2.49
	3.77	3.63	3.88	3.90	3.67	3.10	3.40	3.49
	4.77	4.58	4.18	4.90	4.03	3.67	4.34	4.49
	5.77	5.33	5.18	5.90	5.03	4.67	5.24	5.49
	6.77	6.18	6.00	6.90	6.03	5.67	6.24	6.49
	7.77	7.33	7.18	7.90	7.03	6.67	7.24	7.49
	8.77	8.18	8.00	8.90	8.03	7.67	8.24	8.49
	9.77	9.33	9.18	9.90	9.03	8.67	9.24	9.49
	10.77	10.18	10.00	10.90	10.03	9.67	10.24	10.49
	11.77	11.33	11.18	11.90	11.03	10.67	11.24	11.49
	12.77	12.18	12.00	12.90	12.03	11.67	12.24	12.49
	13.77	13.33	13.18	13.90	13.03	12.67	13.24	13.49
	14.77	14.18	14.00	14.90	14.03	13.67	14.24	14.49
	15.77	15.33	15.18	15.90	15.03	14.67	15.24	15.49
	16.77	16.18	16.00	16.90	16.03	15.67	16.24	16.49
	17.77	17.33	17.18	17.90	17.03	16.67	17.24	17.49
	18.77	18.18	18.00	18.90	18.03	17.67	18.24	18.49
	19.77	19.33	19.18	19.90	19.03	18.67	19.24	19.49
	20.77	20.18	20.00	20.90	20.03	19.67	20.24	20.49
	21.77	21.33	21.18	21.90	21.03	20.67	21.24	21.49
	22.77	22.18	22.00	22.90	22.03	21.67	22.24	22.49
	23.77	23.33	23.18	23.90	23.03	22.67	23.24	23.49
	24.77	24.18	24.00	24.90	24.03	23.67	24.24	24.49
	25.77	25.33	25.18	25.90	25.03	24.67	25.24	25.49
	26.77	26.18	26.00	26.90	26.03	25.67	26.24	26.49
	27.77	27.33	27.18	27.90	27.03	26.67	27.24	27.49
	28.77	28.18	28.00	28.90	28.03	27.67	28.24	28.49
	29.77	29.33	29.18	29.90	29.03	28.67	29.24	29.49
	30.77	30.18	30.00	30.90	30.03	29.67	30.24	30.49
	31.77	31.33	31.18	31.90	31.03	30.67	31.24	31.49
	32.77	32.18	32.00	32.90	32.03	31.67	32.24	32.49
	33.77	33.33	33.18	33.90	33.03	32.67	33.24	33.49
	34.77	34.18	34.00	34.90	34.03	33.67	34.24	34.49
	35.77	35.33	35.18	35.90	35.03	34.67	35.24	35.49
	36.77	36.18	36.00	36.90	36.03	35.67	36.24	36.49
	37.77	37.33	37.18	37.90	37.03	36.67	37.24	37.49
	38.77	38.18	38.00	38.90	38.03	37.67	38.24	38.49
	39.77	39.33	39.18	39.90	39.03	38.67	39.24	39.49
	40.77	40.18	40.00	40.90	40.03	39.67	40.24	40.49
	41.77	41.33	41.18	41.90	41.03	40.67	41.24	41.49
	42.77	42.18	42.00	42.90	42.03	41.67	42.24	42.49
	43.77	43.33	43.18	43.90	43.03	42.67	43.24	43.49
	44.77	44.18	44.00	44.90	44.03	43.67	44.24	44.49
	45.77	45.33	45.18	45.90	45.03	44.67	45.24	45.49
	46.77	46.18	46.00	46.90	46.03	45.67	46.24	46.49
	47.77	47.33	47.18	47.90	47.03	46.67	47.24	47.49
	48.77	48.18	48.00	48.90	48.03	47.67	48.24	48.49
	49.77	49.33	49.18	49.90	49.03	48.67	49.24	49.49
	50.77	50.18	50.00	50.90	50.03	49.67	50.24	50.49
	51.77	51.33	51.18	51.90	51.03	50.67	51.24	51.49
	52.77	52.18	52.00	52.90	52.03	51.67	52.24	52.49
	53.77	53.33	53.18	53.90	53.03	52.67	53.24	53.49
	54.77	54.18	54.00	54.90	54.03	53.67	54.24	54.49
	55.77	55.33	55.18	55.90	55.03	54.67	55.24	55.49
	56.77	56.18	56.00	56.90	56.03	55.67	56.24	56.49
	57.77	57.33	57.18	57.90	57.03	56.67	57.24	57.49
	58.77	58.18	58.00	58.90	58.03	57.67	58.24	58.49
	59.77	59.33	59.18	59.90	59.03	58.67	59.24	59.49
	60.77	60.18	60.00	60.90	60.03	59.67	60.24	60.49
	61.77	61.33	61.18	61.90	61.03	60.67	61.24	61.49
	62.77	62.18	62.00	62.90	62.03	61.67	62.24	62.49
	63.77	63.33	63.18	63.90	63.03	62.67	63.24	63.49
	64.77	64.18	64.00	64.90	64.03	63.67	64.24	64.49
	65.77	65.33	65.18	65.90	65.03	64.67	65.24	65.49
	66.77	66.18	66.00	66.90	66.03	65.67	66.24	66.49
	67.77	67.33	67.18	67.90	67.03	66.67	67.24	67.49
	68.77	68.18	68.00	68.90	68.03	67.67	68.24	68.49
	69.77	69.33	69.18	69.90	69.03	68.67	69.24	69.49
	70.77	70.18	70.00	70.90	70.03	69.67	70.24	70.49
	71.77	71.33	71.18	71.90	71.03	70.67	71.24	71.49
	72.77	72.18	72.00	72.90	72.03	71.67	72.24	72.49
	73.77	73.33	73.18	73.90	73.03	72.67	73.24	73.49
	74.77	74.18	74.00	74.90	74.03	73.67	74.24	74.49
	75.77	75.33	75.18	75.90	75.03	74.67	75.24	75.49
	76.77	76.18	76.00	76.90	76.03	75.67	76.24	76.49
	77.77	77.33	77.18	77.90	77.03	76.67	77.24	77.49
	78.77	78.18	78.00	78.90	78.03	77.67	78.24	78.49
	79.77	79.33	79.18	79.90	79.03	78.67	79.24	79.49
	80.77	80.18	80.00	80.90	80.03	79.67	80.24	80.49
	81.77	81.33	81.18	81.90	81.03	80.67	81.24	81.49
	82.77	82.18	82.00	82.90	82.03	81.67	82.24	82.49
	83.77	83.33	83.18	83.90	83.03	82.67	83.24	83.49
	84.77	84.18	84.00	84.90	84.03	83.67	84.24	84.49
	85.77	85.33	85.18	85.90	85.03	84.67	85.24	85.49
	86.77	86.18	86.00	86.90	86.03	85.67	86.24	86.49
	87.77	87.33	87.18	87.90	87.03	86.67	87.24	87.49
	88.77	88.18	88.00	88.90	88.03	87.67	88.24	88.49
	89.77	89.33	89.18	89.90	89.03	88.67	89.24	89.49
	90.77	90.18	90.00	90.90	90.03	89.67	90.24	90.49
	91.77	91.33	91.18	91.90	91.03	90.67	91.24	91.49
	92.77	92.18	92.00	92.90	92.03	91.67	92.24	92.49
	93.77	93.33	93.18	93.90	93.03	92.67	93.24	93.49
	94.77	94.18	94.00	94.90	94.03	93.67	94.24	94.49
	95.77	95.33	95.18	95.90	95.03	94.67	95.24	95.49
	96.77	96.18	96.00	96.90	96.03	95.67	96.24	96.49
	97.77	97.33	97.18	97.90	97.03	96.67	97.24	97.49
	98.77	98.18	98.00	98.90	98.03	97.67	98.24	98.49
	99.77	99.33	99.18	99.90	99.03	98.67	99.24	99.49
	100.77	100.18	100.00	100.90	100.03	99.67	100.24	100.49
	101.77	101.33	101.18	101.90	101.03	100.67	101.24	101.49
	102.77	102.18	102.00	102.90	102.03	101.67	102.24	102.49
	103.77	103.33	103.18	103.90	103.03	102.67	103.24	103.49
	104.77	104.18	104.00	104.90	104.03	103.67	104.24	104.49
	105.77	105.33	105.18	105.90	105.03	104.67	105.24	105.49
	106.77	106.18	106.00	106.90	106.03	105.67	106.24	106.49
	107.77	107.33	107.18	107.90	107.03	106.67	107.24	107.49
	108.77	108.18	108.00	108.90	108.03	107.67	108.24	108.49
	109.77	109.33	109.18	109.90	109.03	108.67	109.24	109.49
	110.77	110.18	110.00	110.90	110.03	109.67	110.24	110.49
	111.77	111.33	111.18	111.90	111.03	110.67	111.24	111.49
	112.77	112.18	112.00	112.90	112.03	111.67	112.24	112.49
	113.77	113.33	113.18	113.90	113.03	112.67	113.24	113.49
	114.77	114.18	114.00	114.90	114.03	113.67	114.24	114.49
	115.77	115.33	115.18	115.90	115.03	114.67	115.24	115.49
	116.77	116.18	116.00	116.90	116.03	115.67	116.24	116.49
	117.77	117.33	117.18	117.90	117.03	116.67	117.24	117.49
	118.77	118.18	118.00	118.90	118.03	117.67	118.24	118.49
	119.77	119.33	119.18	119.90	119.03	118.67	119.24	119.49
	120.77	120.18	120.00	120.90	120.03	119.67	120.24	120.49
	121.77	121.33	121.18	121.90	121.03	120.67	121.24	121.49
	122.77	122.18	122.00	122.90	122.03	121.67	122.24	122.49
	123.77	123.33	123.18	123.90	123.03	122.67	123.24	123.49
	124.77	124.18	124.00	124.90	124.03	123.67	124.24	124.49
	125.77	125.33	125.18	125.90	125.03	124.67	125.24	125.49
	126.77	126.18	126.00	126.90	126.03	125.67	126.24	126.49
	127.77	127.33	127.18	127.90	127.03	126.67	127.24	127.49
	128.77	128.18	128.00	128.90	128.03	127.67	128.24	128.49
	129.77	129.33	129.18	129.90	129.03	128.67	129.24	129.49
	130.77	130.18	130.00	130.90	130.03	129.67	130.24	130.49
	131.77	131.33	131.18	131.90	131.03	130.67	131.24	131.49
	132.77	132.18	132.00	132.90	132.03	131.67	132.24	132.49
	133.77	133.33	133					

DEPTH

STONY BROOK
OF STOCKWELL BROOK
D/S

STREAM RATING

165 Dam Safety Stockwell Brook 3/15/77 T(HF) 23/42

Estimate attenuated peak at the end of reach 3
dam break

Dam break inflow

Estimate just the peak from break discharge
has been attenuated in reach 2 to

$$Q_{p1} = 4000 \text{ cfs}$$

Total Volume impounded by dam

$$S = 346 \text{ AF}$$

Volume of channel storage in reaches 1 & 2

$$\begin{aligned} Vol_{1:2} &= S \left(1 - \frac{Q_{p2}}{Q_{p1}} \right) \\ &= 346 \left(1 - \frac{4000}{4560} \right) = 42 \text{ AF} \end{aligned}$$

Volume of Storage in Reach 3

Assumed conditions prior to dam break

$$Q = 2500 \text{ cfs}$$

$$\text{Depth} = 5.0'$$

$$\text{Area} = 220^{1/2}$$

Avg. Conditions after dam break

$$\text{guess } Q = 2500 + 3800 = 6300 \text{ cfs}$$

$$\text{Depth} = 7.0'$$

$$\text{Area} = 415^{1/2}$$

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Length of Reach \approx 1 mile = 5000'

Net channel storage of dam break discharge

$$= (415 - 220) \times 5000 \div 43560$$

$$= 22 \text{ AF}$$

Volume of channel storage in reaches 1, 2, 3

$$Vol = V_{1,2} + V_{1,3} = 42 + 22 = 64 \text{ AF}$$

Peak dam break discharge at end of reach

$$Q_{p2} = Q_{p1} \left(1 - \frac{Vol}{S}\right)$$

$$= 4560 \left(1 - \frac{64}{346}\right) = \underline{3700 \text{ cfs}}$$

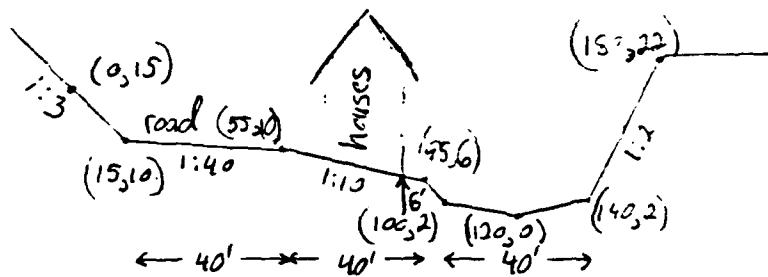
At the end of this reach there is a small, run of the river, overflow structure with a height of approx. 8' and an impoundment of surface area approx. 2 acres

$$Vol \approx 2 \text{ acres} \times 3' \text{ depth}$$
$$= 6 \text{ AF}$$

$$Q_{p2} = 4560 \left(1 - \frac{70}{346}\right) = 3640 \text{ cfs}$$

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Reach 4



Approx. Section of Stony Brook
~ 1/4 mile u/s of Wilton

The following rating table is based on FIS profiles at this point along Stony Brook.

Tr	Q	Depth Flow
10 yr.	2900 cfs	9.1 ft.
50	4700	11.6
100	5200	12.8
500	8100	14.5

Note that the attenuated dam break discharge estimated to be 3640 cfs (not including additional Stony Brook flows) would cause flooding

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to a depth of 10'± above the streambed. There are in this vicinity seven houses, with first floor levels ranging from approximately 6' to 10' above the stream bed, which would be susceptible to serious damage as a result of this level of flooding.

However, FIS flood frequency analysis indicates that this degree of flooding is not unprecedented.

III Test Flood Analysis

Size Classification -- Small

Storage < 1000 AF

Height $< 40'$

Hazard Classification -- Significant

Dam failure would probably result in
serious flooding at 5 to 10 houses
 ~ 2 miles d/s

Test Flood Selection

Per COE guidelines, a Small dam with significant hazard potential should use a 100-yr to 1/2 PMF Test Flood. As the hazard is on the low side of significant, choose the 100-year flood

As there is no streamflow record or previous study at this site, use the flood frequency regression equation published by the USGS in Progress Report on Hydrologic Investigations of Small Drainage Areas in New Hampshire by Denis R. Le Blanc.

Regional Regression Relation

$$Q_{100} = 0.55 A^{1.05} S^{0.56} I^{2.72}$$

$A = 0.4 \text{ sq. mi}$ (Drainage Area, see map next page)

$$S = 200 \text{ ft.} = 333 \text{ ft/mile} \quad (\text{Slope})$$

$$I = 3.0 \text{ in/hr.} \quad (\text{max. 2 year-24 hr. precip})$$

$$Q_{100} = 0.55 \times 0.4^{1.05} \times 333^{0.56} \times 3^{2.72}$$

$$= \underline{108 \text{ cfs}}$$

Note that these values are within the range over which the equation is considered applicable by USGS

Check using Rational Formula

Time of Concentration (BuRec, Design of Small Dams, p. 71)

$$\Delta h = 850 - 608 = 242'$$

$$l = 6000'$$

$$T_c = 21 \text{ min.}$$

Consider retardance due to watershed cover and surface runoff (BuRec, p. 67)

use $T_c = 30 \text{ min.}$

$$100 \text{ yr. - 30 min rainfall} = 2" \quad (\text{W.B., TP 40})$$

$$i = 4" \text{ /hr.}$$

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$$A = .4 \text{ sq. mi.} = 256 \text{ acres}$$

$$C = 0.3 \quad (\text{assumed runoff coef.})$$

$$Q_{100} = C i A = 0.3 \times 4 \times 256 = \underline{307 \text{ cfs}}$$

Check assuming $Q_{100} \approx 1/4 \times \text{PMF}$

from COE, "Maximum Probable Flood Peak Flow Rates"

for mountainous terrain,

$$\text{PMF} = 2500 \text{ csm}$$

$$= 2500 \times 0.4 = 1000 \text{ cfs}$$

$$Q_{100} = 1/4 \times 1000 = \underline{250 \text{ cfs}}$$

Test Flood

use $Q_{100} = \underline{250 \text{ cfs}}$

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Storage Routing through New W.L. Fish Reservoir

Assume that the reservoir level is initially at the top of the stoplogs before occurrence of Test Flood

Stage-Storage function

$$\text{Elev. } 607.5 \text{ (H=0.5)} \text{ Vol} = 300 \text{ AF}$$

$$\text{Surface area} = 23 \text{ acres}$$

Assuming no spreading, storage volumes at higher elevations are estimated by

$$Vol = 300 + (H + 0.5) \times 23$$

Surcharge volume above crest of spillway

$$V = (H + 0.5) \times 23$$

A stage-surcharge storage curve is shown on the following page.

Stage-Discharge function

Calculated previously and replotted on page 33.

165 Dim Sifly Stockwell Brook 100 yr CHF 3/15/75 32/42

Total Run-off Volume (S)

$$\text{R.O. depth} = \frac{1}{4} \times 19 = 4.75" \quad (\text{assumed for}$$

$$S = \text{R.O.} \div 12 \times \text{DA} \times 640$$

100 yr flood
per COE guidelines)

$$= 4.75 \div 12 \times .4 \times 640$$

$$= 101 \text{ AF}$$

Routing (Follow COE guidelines)

$$Q_{p2} = Q_{p1} \left(1 - \frac{V}{S}\right)$$

$$Q_{p1} = 250 \text{ cfs}$$

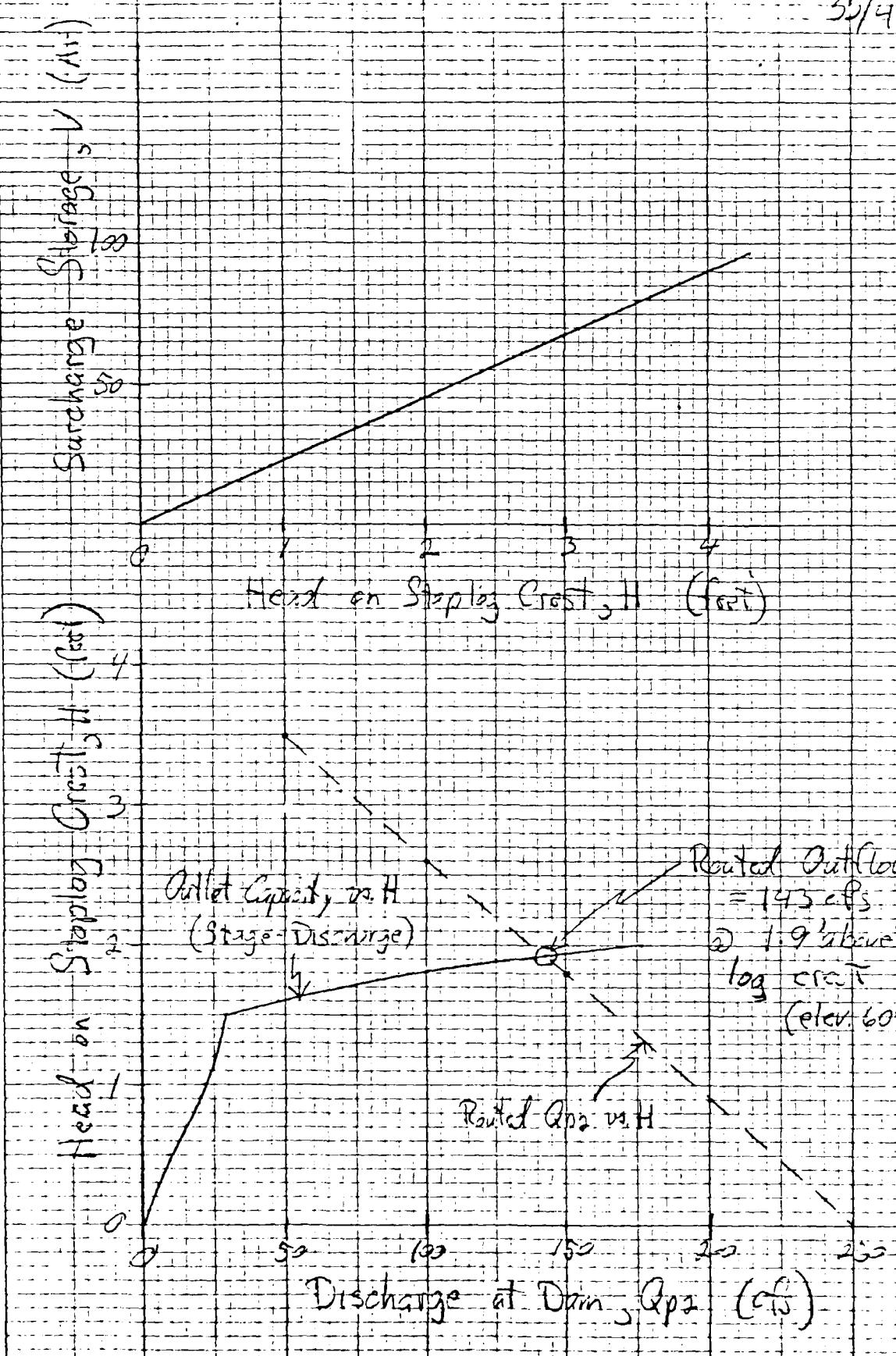
$$S = 101 \text{ AF}$$

$$V = 101 \left(1 - \frac{Q_{p2}}{250}\right)$$

Q_{p2}	V	H
250	0	0
200	20	0.9
150	40	1.8
100	61	2.6
50	81	3.5

This function is plotted along with the outlet capacity of the dam (stage-discharge) to find the outflow and pool level which which satisfies both functions.

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Test Flood Results

Discharge at Dam

$$Q = 143 \text{ cfs}$$

Pool Elevation

$$H = 1.9'$$

Elev. 905.9 ft. MSL

The crest of the earth dam will be overtopped to a depth of 0.4'

Alternate Spillway Configurations

The outlet capacity of the spillway can be increased by removing some of the stop planks currently in place.

Stage-Discharge functions have been computed with the spillway crest lowered to elev. 607.0 and 606.0 and then plotted along with the Q_{ps} vs. H curve on page. Listings of BASIC programs and stage-discharge tables follow.

```

LIST REMARK: STORED ON TAPE 18, FILE 52
110 REMARK: STAGE-DISCHARGE FUNCTION FOR WILTON DAM
111 DIM B$(1)
120 PAGE
130 PRINT "DISCHARGE FROM STOCKWELL BROOK DAM"
140 PRINT USING 150:
150 IMAGE /2"HEAD"30T"DISCHARGE"
160 PRINT USING 170:
170 IMAGE 1T"(FEET)"32T"(CFS)""
180 PRINT USING 190:
190 IMAGE 10T"TOTAL CONTROL SPILLWAY DAM CREST SIDE SLOPES"
200 FOR H=0 TO 5 STEP 0.25
210 Q0=3*(8-0.2*H)*H^1.5
210 Q0=1.4*(2*32.2*(H+20)/2.3)^10.5+3.1*(2.32.2*(H+20)/2.1)^10.5
221 N=Q1<Q0
222 M=1
230 Q1=Q0 MIN Q1
235 Q2=0
240 Q3=0
250 Q4=0
260 Q5=0
270 IF H<=1.5 THEN 310
274 Q0=0.6*1.2*(2*32.2*(H-0.75))^10.5
275 N=Q1<Q0
276 Q1=Q0 MIN Q1
277 IF H<=2.5 THEN 310
280 Q2=2.8*1.23.5*(H-2.5)^1.5
290 Q3=2.8*20*(H-2.5)^1.5
300 Q4=2*2.8*2*(H-2.5)*(0.5*(H-2.5))^11.5
310 Q5=Q3+Q4
320 Q6=Q1+Q2+Q5
321 IF M=0 THEN 327
322 IF N=0 THEN 325
323 LET B$="P"

```

```
324 GO TO 330
325 LET B$="U"
326 GO TO 330
327 LET B$="O"
328 PRINT USING 340:H,Q6,B$,Q1,Q2,Q5
329 IMAGE 2T,2D,2D,9D,5X,1A,2X,10D,11D,13D
330 NEXT H
340 END
```

DISCHARGE FROM STOCKWELL BROOK DAM

HEAD (FEET)	TOTAL DISCHARGE (CCFS)	CONTROL WEIR	DISCHARGE (CCFS)	SPILLWAY	DAM CREST	SIDE SLOPES
0.00	0	0	0	0	0	0
0.25	0.3	3	0	0	0	0
0.50	0.9	9	0	0	0	0
0.75	1.6	17	0	0	0	0
1.00	2.6	26	0	0	0	0
1.25	3.6	47	0	0	0	0
1.50	4.7	58	0	0	0	0
1.75	5.9	65	0	0	0	0
2.00	7.1	71	0	0	0	0
2.25	7.6	76	0	0	0	0
2.50	8.2	82	0	0	0	0
2.75	8.7	87	0	0	0	0
3.00	9.1	91	0	0	0	0
3.25	9.6	96	0	0	0	0
3.50	10.0	100	0	0	0	0
3.75	10.6	106	0	0	0	0
4.00	11.4	114	0	0	0	0
4.25	10.54	1054	0	0	0	0
4.50	11.2	112	0	0	0	0
4.75	11.6	116	0	0	0	0
5.00	11.9	119	0	0	0	0

SPILLWAY CREST AT ELEV. 607.0

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```

LIST REMARK: STORED ON TAPE 18, FILE 52
100 REMARK: STAGE-DISCHARGE FUNCTION FOR WILTON DAM
110 DIN B$(1)
120 PAGE
130 PRINT "DISCHARGE FROM STOCKWELL BROOK DAM"
140 PRINT USING 150:
150 IMAGE /2T"HEAD"30T"DISCHARGE"
160 PRINT USING 170:
170 IMAGE 1T"(FEET)"32T"(CFS)"
180 PRINT USING 190:
190 IMAGE 10T"TOTAL CONTROL SPILLWAY DAM CREST SIDE SLOPES"
200 FOR H=0 TO 5 STEP 0.25
210 Q0=3.3*(8-0.2*H)*H^1.5
220 Q1=1.4*(2*32.2*(H+19)/2.3)^0.5+3.1*(2*32.2*(H+19)/2.1)^0.5
221 H=Q1<Q0
222 M=1
230 Q1=Q0 MIN Q1
235 Q2=0
240 Q2=2
250 Q4=0
260 Q5=0
270 IF H<=2.5 THEN 310
274 Q0=0.6*20*(2*32.2*(H-1.25))^0.5
275 M=Q1<Q0
276 Q1=Q0 MIN Q1
277 IF H<=3.5 THEN 310
280 Q2=2.8*123.5*(H-3.5)^1.5
289 Q3=2.8*20*(H-3.5)^1.5
300 Q4=2*2.8*2*(H-3.5)*(0.5*(H-3.5))^11.5
310 Q5=Q3+Q4
320 Q6=Q1+Q2+Q5
321 IF M=0 THEN 327
322 IF N=0 THEN 325
323 LET B$="P"

```

```
324 GO TO 330
325 LET B$="H"
326 GO TO 330
327 LET B$="O"
328 PRINT USING 340;H,06,0$,01,02,05
329 PRINT USING 340;H,06,0$,01,02,05
330 PRINT USING 340;H,06,0$,01,02,05
331 PRINT USING 340;H,06,0$,01,02,05
332 PRINT USING 340;H,06,0$,01,02,05
333 PRINT USING 340;H,06,0$,01,02,05
334 IMAGE 21,20.2D,9D,5X,1A,2X,10D,11D,13D
335 NEXT H
336 END
```

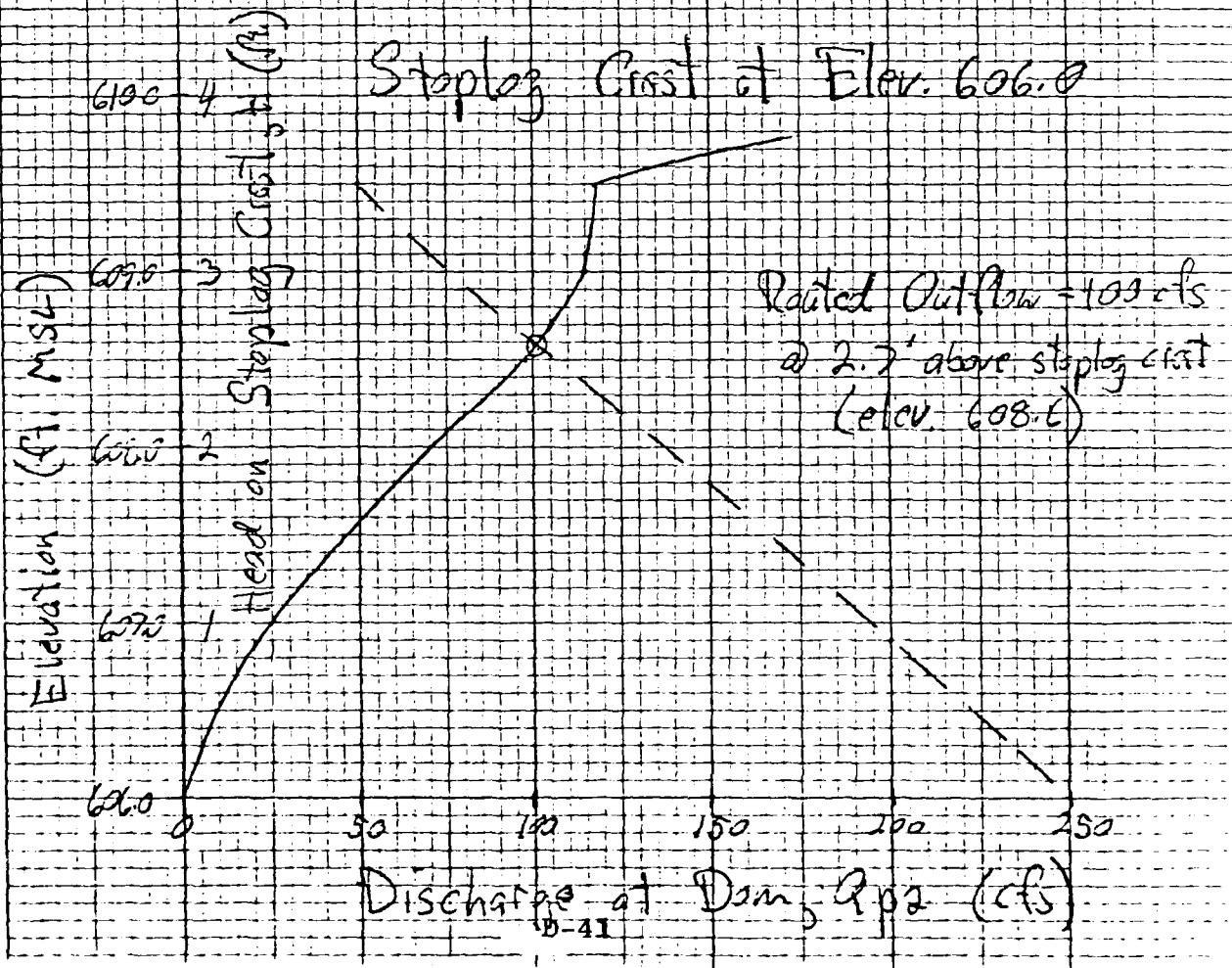
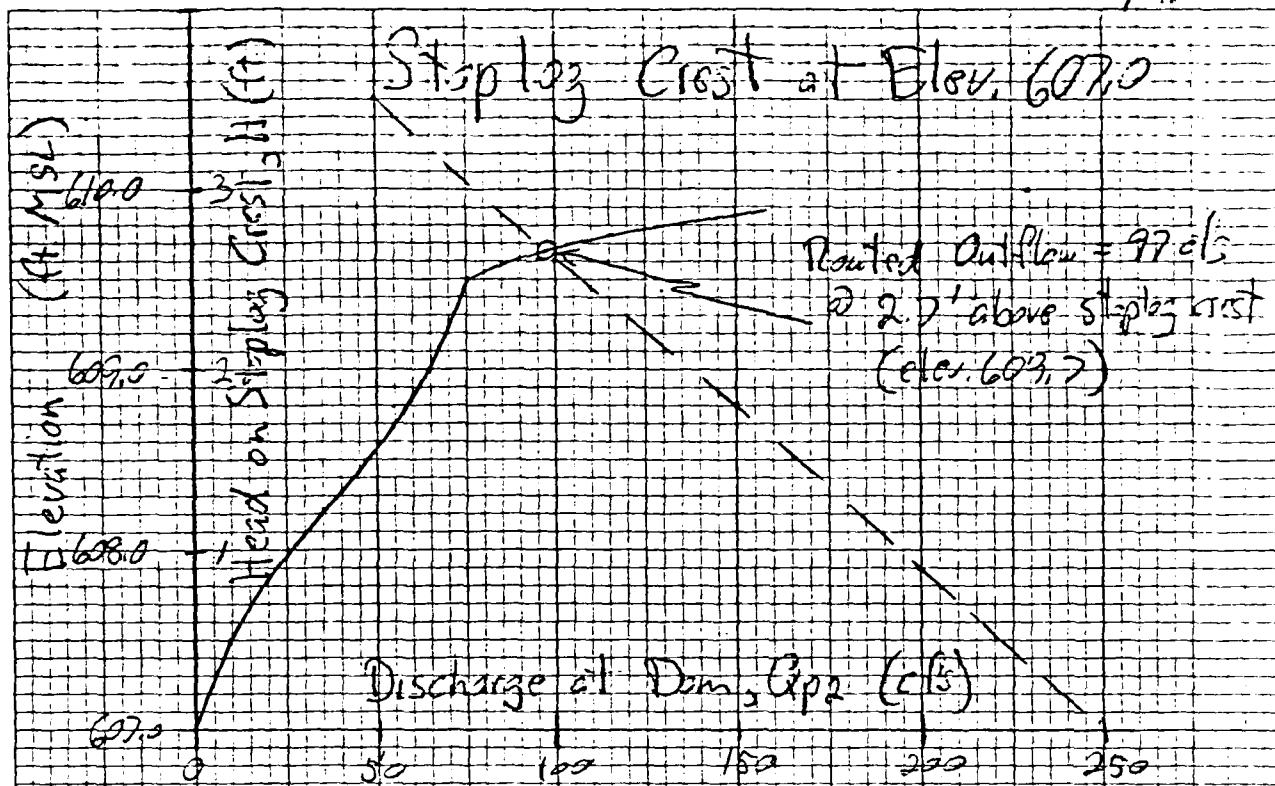
DISCHARGE FROM STOCKWELL BROOK DAM

HEAD (FEET)	TOTAL DISCHARGE (CFS)	CONTROL WEIR	SPILLWAY	DAM CREST	SIDE SLOPES
0.00	0				
0.25	3				
0.50	17				
0.75	126				
1.00	36				
1.25	47				
1.50	58				
1.75	71				
2.00	84				
2.25	98				
2.50	112				
2.75	115	pipe			
3.00	116	P			
3.25	117	P			
3.50	118	P			
3.75	119	P			
4.00	120	P			
4.25	122	P			
4.50	225	P			
4.75	346	P			
5.00	483	P			
	635				
	669				
	869				

SPILLWAY CREST AT ELEV. 606.0

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Dam safety

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Reservoir Drawdown Time *

Elev.	Storage Δ Storage Ac.-Ft.	Discharge cfs	Average Discharge cfs	Drawdown Time days	Drawdown ≤ Drawdown Time days
609.5	335	29	25	.50	0.24
609.0	323	12	22	15	0.40
608.5	311	12	9	20	0.64
608.0	300	11	5	1.1	1.74
		0	0		

* from top of dam to stoplog crest @ elev. 608.0

Assume no inflow

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

1) STATE, COUNTY, DIST.		2) CITY, TOWN, VILLAGE		3) NAME		4) POPULAR NAME		5) NEAREST DOWNSTREAM CITY - TOWN - VILLAGE		6) RIVER OR STREAM		7) TYPE OF DAM		8) YEAR COMPLETED		9) PURPOSES		10) STRUCTURE		11) MAXIMUM HEAD		12) MAXIMUM HEIGHT		13) MAXIMUM CAPACITY		14) NAVIGATION		15) DIRT FARM DAM (MIL.)		16) POPULATION		17) LATITUDE (NORTH)		18) LONGITUDE (WEST)		19) REPORT DATE																																																																																																					
ILLINOIS, KENOSHA COUNTY, STATE DIST.		ELKHORN CITY		STOCKTON BRIDGE DAM		STOCKTON BRIDGE DAM		WILTON		STOCKTON RIVER		MUDWALL		1935		5		FEDERAL		100		100		100		100		100		100		100		4250.4		7140.3		2/14/59																																																																																																			
20) NAME OF IMPOUNDMENT		21) NAME OF RESERVOIR		22) REMARKS		23) ENGINEERING BY		24) CONSTRUCTION BY		25) RECH. AGENCY		26) OPERATION		27) MAINTENANCE		28) INSPECTION BY		29) INSPECTION DATE		30) AUTHORITY FOR INSPECTION		31) REMARKS																																																																																																																			
32) CONCRETE, CURTAIN, ETC.		33) MATERIALS		34) CONCRETE, CURTAIN, ETC.		35) CONCRETE, CURTAIN, ETC.		36) CONCRETE, CURTAIN, ETC.		37) CONCRETE, CURTAIN, ETC.		38) CONCRETE, CURTAIN, ETC.		39) CONCRETE, CURTAIN, ETC.		40) CONCRETE, CURTAIN, ETC.		41) CONCRETE, CURTAIN, ETC.		42) CONCRETE, CURTAIN, ETC.		43) CONCRETE, CURTAIN, ETC.		44) CONCRETE, CURTAIN, ETC.		45) CONCRETE, CURTAIN, ETC.		46) CONCRETE, CURTAIN, ETC.		47) CONCRETE, CURTAIN, ETC.		48) CONCRETE, CURTAIN, ETC.		49) CONCRETE, CURTAIN, ETC.		50) CONCRETE, CURTAIN, ETC.		51) CONCRETE, CURTAIN, ETC.		52) CONCRETE, CURTAIN, ETC.		53) CONCRETE, CURTAIN, ETC.		54) CONCRETE, CURTAIN, ETC.		55) CONCRETE, CURTAIN, ETC.		56) CONCRETE, CURTAIN, ETC.		57) CONCRETE, CURTAIN, ETC.		58) CONCRETE, CURTAIN, ETC.		59) CONCRETE, CURTAIN, ETC.		60) CONCRETE, CURTAIN, ETC.		61) CONCRETE, CURTAIN, ETC.		62) CONCRETE, CURTAIN, ETC.		63) CONCRETE, CURTAIN, ETC.		64) CONCRETE, CURTAIN, ETC.		65) CONCRETE, CURTAIN, ETC.		66) CONCRETE, CURTAIN, ETC.		67) CONCRETE, CURTAIN, ETC.		68) CONCRETE, CURTAIN, ETC.		69) CONCRETE, CURTAIN, ETC.		70) CONCRETE, CURTAIN, ETC.		71) CONCRETE, CURTAIN, ETC.		72) CONCRETE, CURTAIN, ETC.		73) CONCRETE, CURTAIN, ETC.		74) CONCRETE, CURTAIN, ETC.		75) CONCRETE, CURTAIN, ETC.		76) CONCRETE, CURTAIN, ETC.		77) CONCRETE, CURTAIN, ETC.		78) CONCRETE, CURTAIN, ETC.		79) CONCRETE, CURTAIN, ETC.		80) CONCRETE, CURTAIN, ETC.		81) CONCRETE, CURTAIN, ETC.		82) CONCRETE, CURTAIN, ETC.		83) CONCRETE, CURTAIN, ETC.		84) CONCRETE, CURTAIN, ETC.		85) CONCRETE, CURTAIN, ETC.		86) CONCRETE, CURTAIN, ETC.		87) CONCRETE, CURTAIN, ETC.		88) CONCRETE, CURTAIN, ETC.		89) CONCRETE, CURTAIN, ETC.		90) CONCRETE, CURTAIN, ETC.		91) CONCRETE, CURTAIN, ETC.		92) CONCRETE, CURTAIN, ETC.		93) CONCRETE, CURTAIN, ETC.		94) CONCRETE, CURTAIN, ETC.		95) CONCRETE, CURTAIN, ETC.		96) CONCRETE, CURTAIN, ETC.		97) CONCRETE, CURTAIN, ETC.		98) CONCRETE, CURTAIN, ETC.		99) CONCRETE, CURTAIN, ETC.		100) CONCRETE, CURTAIN, ETC.	

END

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